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National Research Council Canada

2011-12

Departmental Performance Report

Christian Paradis
Minister of Industry and Minister of State (Agriculture)

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Minister's Message

The Department of Industry and the other members of the Portfolio have made significant progress on a number of priorities in 2011–12.

This past year, the Industry Portfolio has worked to strengthen Canada's business environment, support scientific research and development, encourage business-driven innovation, and modernize our laws for the digital economy. The Government of Canada has made science, technology and innovation a priority since 2006, and, as this report shows, we are continuing to fulfil our commitment.

In 2011–12, the first year of the Digital Technology Adoption Pilot Program, the National Research Council of Canada's (NRC) Industrial Research Assistance Program contributed $1.3 million to firms, $0.4 million to colleges and $0.6 million to not-for-profit organizations. It also provided $90.4 million to 1,811 firms and 154 organizations for a total of 2,317 innovation projects, supporting 6,492 jobs, including 213 for recent graduates. NRC also contributed to federal priorities such as sustainable energy by developing technologies to increase energy efficiency in buildings, convert biomaterials into clean energy and energy storage for sustainable transportation.

Our government understands that innovation is one of the most important contributors to future economic growth. By creating new products and services, opening new markets and rethinking today's technologies, Canadian researchers, entrepreneurs and businesses across the country will help create new jobs, spur economic growth and ensure Canada's long-term prosperity.

As we move forward, the Industry Portfolio will continue to support government priorities while taking important steps to restore fiscal balance in the medium term. Through the right mix of strategic investment, marketplace frameworks and modern programs and services, we will continue to set the conditions for companies to succeed at home and abroad.

It is my pleasure to present the 2011–12 Departmental Performance Report for the National Research Council of Canada.

Christian Paradis

Minister of Industry and Minister of State (Agriculture)

Minister of State's Message

As the Minister of State for Science and Technology, my priority is the promotion of Canadian science, technology and innovation. Not only do they lead to important discoveries that benefit society, but they also are the foundation for greater productivity, competitiveness, job creation and economic growth.

For this reason, our government has been laying the groundwork to be able to leverage the benefits of science and technology. In recent years, our focus has been on strengthening three key elements of Canada's innovation ecosystem: developing and recruiting world-leading research talent, modernizing research infrastructure across the country and stimulating private sector innovation. Since 2006, we have invested nearly $8 billion in new funding for science, technology and the growth of innovative firms—and our efforts are paying off.

Our institutes of higher education do well in international rankings, and we have developed a productive research community. Canada ranks first in the G7 for higher-education research spending, measured as a percentage of GDP. Our scientific research enterprise was also ranked fourth highest in the world by over 5,000 leading international researchers, according to the Council of Canadian Academies' 2012 report on the state of science and technology in Canada. This performance has been underpinned by funding provided by the Natural Sciences and Engineering Research Council of Canada, the Social Sciences and Humanities Research Council of Canada, and the National Research Council of Canada. As well, through Economic Action Plan 2012, we responded to the expert panel's Review of Federal Support to Research and Development (R&D), which offered recommendations on how to strengthen support for business R&D.

In 2011–12, the National Research Council of Canada (NRC) continued to provide research and support services and worked with private and public partners to address needs and opportunities for Canadian health and wellness and in important industrial sectors such as information and communications technologies, automotive, aerospace and construction. These sectors, which are technology intensive and depend on innovation for their growth and competitiveness, benefit from the unique resources and knowledge that NRC provides.

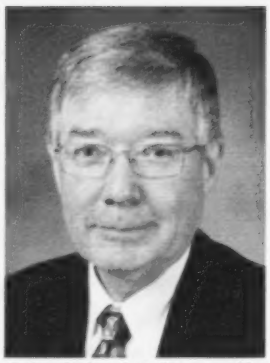
Through these measures, we have taken action to build a strong innovation system that ensures Canadian researchers continue to generate groundbreaking ideas and businesses have access to the knowledge, people and resources needed to market those ideas and create high-quality jobs.

It is my pleasure to join my colleague, the Honourable Christian Paradis, Minister of Industry, in presenting the 2011–12 Departmental Performance Report for the National Research Council of Canada.

Gary Goodyear

Minister of State (Science and Technology)

President's Message


Mr. John McDougall, President

I am pleased to submit for tabling in Parliament the 2011-12 Departmental Performance Report for the National Research Council of Canada. In response to Canada's need to improve innovation performance and productivity, and in direct alignment to the Government of Canada's science and technology strategy, *Mobilizing Science and Technology to Canada's Advantage*, the NRC is refocusing into a unified, industry-driven organization addressing areas of national importance.

This past year has been one of continued change at the NRC. We believe that NRC needs to move away from operating as a mosaic of research institutes into streamlined units that focus on key industrial sectors to help improve industry's productivity and competitiveness. We also completed a thorough review of our corporate processes and systems (financial, business and administrative) to find efficiencies and support our new industry-focused strategic direction. This included the transfer of information technology (IT) services to the new Shared Services Canada organization, and conducting a review of our common services (e.g. administration, procurement, communications) in order to deliver them in a more integrated and client-focused manner.

NRC's role in supporting the Canadian S&T innovation system continues to evolve, and was even highlighted in the expert panel Review of Federal Support to Research and Development. Speifically, NRC's Industrial Research Assistance Program (NRC-IRAP) was recognized by the expert panel as one of the best managed and effective government programs to facilitate R&D and commercialization by small and medium enterprises (SMEs). This was reinforced by the government's $80M investment over three years through the Digital Technology Adoption Pilot Program (DTAPP), aimed at helping accelerate the adoption of information and communications technologies by SMEs. In this year's Federal budget, NRC-IRAP received an additional $110M to further the government's commitment to boost the innovation of Canadian firms. The Expert Panel's recommendations reinforce the need for a continued contribution to innovation in Canada, and I am confident that NRC is on the right track to fulfill this need.

Overall, we are confident that our shift toward more support for Canadian business will make NRC a much more attractive and valuable partner to industry, and enable NRC to make a much larger contribution to innovation in Canada.

Section I: Organizational Overview

Raison d'être

The National Research Council Canada (NRC) bridges the innovation gap between early stage research and development (R&D) and commercialization, focusing on socio-economic benefits for Canadians and increasing national performance in innovation. A federal leader in technology development, NRC supports the business sector in Canada to enhance innovation capabilities and capacity and become more productive in the development and deployment of innovative products, processes and services for targeted markets. With a presence in every province, NRC combines a strong national foundation with international linkages to help Canada grow in productivity and remain globally competitive. To ensure a multi-disciplinary and integrated approach, NRC works in collaboration with industry, governments, and academia.

NRC's strategic direction will strengthen the areas where NRC makes unique and compelling contributions:

- Developing and deploying leading-edge technology in areas of national priority to support sustainable domestic prosperity;
- Fostering industrial, community, and small and medium-sized enterprises (SMEs) innovation, growth, and productivity through targeted support;
- Managing large national research infrastructure and facilities for the scientific and industrial sectors to help push innovation forward and keep Canada at the cutting-edge.

NRC's strategic intent is founded upon a vision and mission designed to support federal science and technology (S&T) priorities.

NRC VISION

To be the most effective research and technology organization in the world, stimulating sustainable domestic prosperity.

NRC MISSION

Working with clients and partners, we provide innovation support, strategic research, and scientific and technical services to develop and deploy solutions to meet Canada's current and future industrial and societal needs.

Responsibilities

Under the [1] *National Research Council Act*, NRC is responsible for:

- Undertaking, assisting or promoting scientific and industrial research in fields of importance to Canada;
- Providing vital scientific and technological services to the research and industrial communities;
- Investigating standards and methods of measurement;
- Working on the standardization and certification of scientific and technical apparatus, instruments and materials used or usable by Canadian industry;

- Operating and administering any astronomical observatories established or maintained by the Government of Canada;
- Establishing, operating and maintaining a national science library; and
- Publishing and selling or otherwise distributing such scientific and technical information as the Council deems necessary.

NRC Accountability Framework

NRC is a departmental corporation of the Government of Canada, reporting to Parliament through the Minister of Industry. NRC works in partnership with members of the Industry Portfolio to leverage complementary resources to promote the innovation of firms, to exploit synergies in key areas of S&T, to promote the growth of small and medium-sized firms (SMEs), and to contribute to Canadian economic growth. NRC's Council provides independent strategic direction and advice to the President and reviews organizational performance. The President provides leadership and strategic management and is responsible for the achievement of NRC's long-range goals and plans within the guidance of the NRC Council. Each of six Vice Presidents is responsible for a number of areas composed of research programs, initiatives, centres and/or a corporate branch. Vice Presidents and NRC managers are responsible for executing plans and priorities to ensure successful achievement of objectives.

Strategic Outcomes and Program Activity Architecture (PAA)

To fulfill its mandate, NRC's programs are aligned to achieve two Strategic Outcomes (SOs):

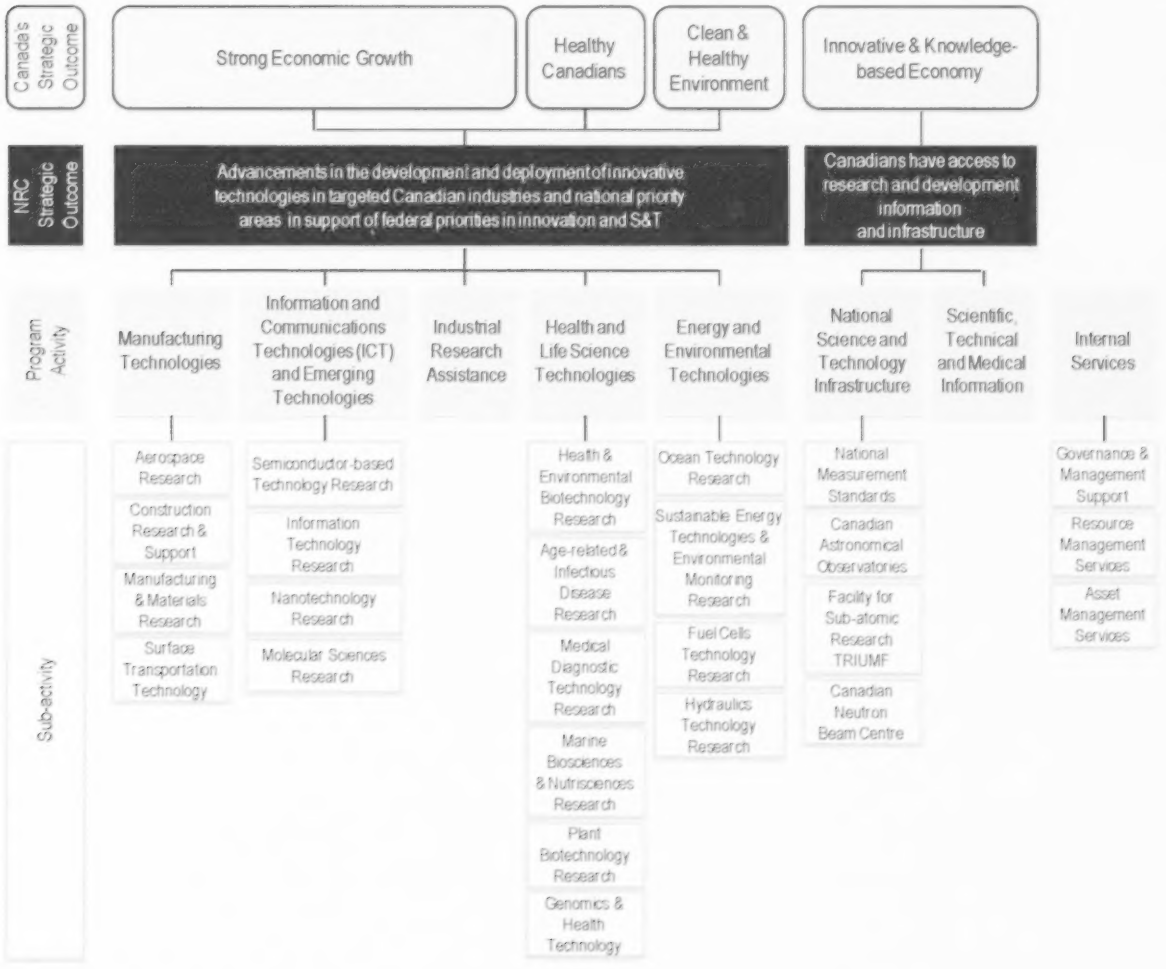
SO1. Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas.

SO2. Canadians have access to research and development information and infrastructure.

NRC's approach is directly aligned to the [2] Government of Canada's science and technology (S&T) strategy, *Mobilizing Science and Technology to Canada's Advantage* and the four federal S&T priority areas: Information and communications technologies, environmental science and technologies, natural resources and energy, and health and related life sciences and technologies. NRC actively contributes to these priority areas by supporting research and providing innovation support related to a variety of key areas, including natural resource value chains, climate change and the environment, health care cost pressures, complex security challenges, communities, and economic growth and industrial sustainability.

NRC's Program Activities (PAs) directly support the delivery of NRC's Strategic Outcomes, aligning the strengths and critical mass required to achieve four of [3] Canada's Strategic Outcomes (SOs): strong economic growth; healthy Canadians; a clean and healthy environment; and an innovative and knowledge-based economy. The approved 2011-12 NRC PAA structure, shown below, represents how activities are organized to achieve these desired results, and is aligned with Government of Canada's Strategic Outcomes and federal priorities. As NRC's new strategy is developed, the NRC

PAA will be reviewed, and amended as necessary, to ensure continued alignment and contribution towards Canada's Strategic Outcomes.


Canada's Strategic Outcome
Strong Economic Growth
Healthy Canadians
Clean & Healthy Environment
Innovative & Knowledge-based Economy
NRC Strategic Outcome
Advancements in the development and deployment of innovative technologies in targeted Canadian industries and national priority areas in support of federal priorities in innovation and S&T
Canadians have access to research and development information and infrastructure
Program Activity
Manufacturing Technologies
Information and Communications Technologies (ICT) and Emerging Technologies
Industrial Research Assistance
Health and Life Science Technologies
Energy and Environmental Technologies
National Science and Technology Infrastructure
Scientific, Technical and Medical Information
Internal Services
Sub-activity
Aerospace Research
Construction Research & Support
Manufacturing & Materials Research
Surface Transportation Technology
Semiconductor-based Technology Research
Information Technology Research
Nanotechnology Research
Molecular Sciences Research
Health & Environmental Biotechnology Research
Age-related & Infectious Disease Research
Medical Diagnostic Technology Research
Marine Biosciences & Nutrisciences Research
Plant Biotechnology Research
Genomics & Health Technology
Ocean Technology Research
Sustainable Energy Technologies & Environmental Monitoring Research
Fuel Cells Technology Research
Hydraulics Technology Research
National Measurement Standards
Canadian Astronomical Observatories
Facility for Sub-atomic Research TRIUMF
Canadian Neutron Beam Centre
Governance & Management Support
Resource Management Services
Asset Management Services

Organizational Priorities

Operational Priority 1	Type[1]	Strategic Outcome
To foster business innovation and increase productivity of key industrial sectors, such as ICT, and to support the economic growth and development of communities across Canada.	Ongoing	SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas
• NRC provided research and support services to targeted industrial sectors such as ICT, automotive, aerospace and construction, working with private and public partners to address immediate and future needs and opportunities through strategic research and services such as assembly and integration of devices and access to incubator space. These sectors benefit from the resources and knowledge that NRC		

[1] Type is defined as: **Previously committed to** – committed to in the first or second fiscal year before the subject year of the report; **Ongoing** – committed to at least three fiscal years before the subject year of the report; and **New** – newly committed to in the reporting year of the Reports on Plans and Priorities or the Departmental Performance Report.

provides, as they are technologically intensive and depend on innovation for their growth and competitiveness. In several cases, NRC's involvement resulted in increases in industry's Technology Readiness Levels (TRL) to 7 or 8, representing fast tracking of industry innovation. Focus was placed on emerging technologies that are increasing in prominence in our society and globally, such as green technologies for the manufacturing sector, smart buildings, and nano-science applications for key industries.

- NRC assisted SMEs to develop technologies and successfully commercialize them in a global marketplace by providing technical and business advisory services, financial assistance, and networking and linkage opportunities. In 2011-12, the NRC Industrial Research Assistance (NRC-IRAP) Program Activity provided $90.4M to 1,811 firms and 154 organizations for 2,317 innovation projects that supported 6,492 jobs, including 213 for recent graduates. Additionally, 7,532 SMEs received specialized advisory assistance.
- NRC continued to facilitate innovations to market through its licensing activities. During 2011-12, revenue receipts from rights and privileges declined slightly from a high of $9.8M (in 2010-11) to $8.5M. The number of licensed parties declined slightly from 179 to 167, of which 54 were new licensees.
- NRC stimulated growth and economic development by drawing companies to regions and communities across Canada supported by its presence – enabling networking with and between universities, governments and industries to accelerate the commercialization of products and processes in key technology areas such as photonics.

Operational Priority 2	Type	Strategic Outcome
To support and conduct R&D in areas of national importance such as energy, the environment, and health.	Ongoing	SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas

- NRC contributed to federal priorities in sustainable energy by working to develop technologies to increase energy efficiency for industrial and residential facilities (e.g., developing and demonstrating zero-peak houses), convert biomaterials into clean energy and store energy for sustainable transportation. NRC led and participated in various horizontal activities and in collaboration with government, academia and the private sector, focusing on lighter materials for the aerospace and automotive industries, biofuels, green buildings, water quality, and sustainable agriculture.
- NRC collaborated with academic, government and private sector players to conduct R&D and develop applications and market solutions in areas such as general health and wellness, age-related and infectious diseases, and the prevention, early diagnosis and improved treatment of diseases such as cancer.

Operational Priority 3	Type	Strategic Outcome
To provide integrated scientific support to enhance the generation and commercialization of knowledge.	Ongoing	SO2: Canadians have access to research and development information and infrastructure

- NRC implemented several enhancements that improved access to high-value information and research outputs to support better decision-making in Canada's innovation community. NRC launched the "CISTI Mobile app" and DataCite Canada (a free service to register digital object identifiers (DOIs) for data sets and publications), and additionally improved access to the PubMed Central Canada repository of medical-related publications by upgrading its infrastructure.
- NRC provided access to science infrastructure for a number of Canadian research communities. In 2011-12, early science operations began at the Atacama Large Millimetre Array (ALMA) in Chile, and NRC formally joined the international SKA Organisation in order to participate in the pre-construction of the Square Kilometre Array (SKA), a global project involving 20 nations and a key priority for the Canadian astronomy research community.

Management Priority	Type	Strategic Outcomes
To ensure effective program and organizational management for a sustainable organization.	Ongoing	SO1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas, and, SO2: Canadians have access to research and development information and infrastructure

- NRC began re-focusing its activities to create streamlined units that target key industrial sectors and priorities facing Canada. New processes and supporting systems were developed, to improve life-cycle program management and strengthen NRC as an outcome-oriented organization. The new foci represent areas of strategic importance and economic value for the country, where technology intensity is high and NRC's involvement and R&D capabilities will have a significant impact on the industry's productivity and competitiveness. All program leads in these areas received program management training (adopting the Project Management Institute (PMI) global standard) and were trained to use the SAP software system for a common project management and planning approach.
- NRC focused on human resource initiatives to attract and engage talent, plan for succession and create a shared values system across NRC. These included: a review of NRC's hiring policy and recruitment activities and implementation of a centralized hiring model; the development of a common orientation and integration program for new employees; development of leadership capability across the organization; and specialized training to managers and supervisors aligned to organizational values. NRC also launched its new Commitment To Excellence (CTE) Program, enabling NRC to plan, enable and recognize employee performance. The CTE program reflects NRC's outcome-oriented focus and encourages superior performance to support development of individual and organizational excellence.
- NRC launched a national business-to-business promotional campaign to position itself as a solution provider for Canadian industry, re-vamped its corporate web content, and increased proactive media relations activities to profile industry successes and public interest innovations. New services and protocols in media relations have ensured a strong and topical media presence in the public domain.
- NRC strengthened its financial management and control practices with its continued implementation and monitoring in support of the Policy of Internal Control over Financial Reporting (ICFR).
- NRC reorganized how it delivers Information Technology (IT) services. With the creation of Shared Services Canada (SSC), NRC transferred approximately 78 staff to the new department. SSC is now responsible for provisioning NRC's network, server infrastructure, data centre and e-mail services.
- NRC consolidated its security organization into a single group, and broadened its mandate to include all NRC sites and facilities. A departmental security plan and new security policy were also developed to address gaps in security, eliminate duplicate services and standardize the delivery of security services across NRC.
- NRC completed its Real Property Management Framework and Real Property Transaction Management Framework, improving capacity in the management of a sustainable real property. This included the introduction of a building performance evaluation tool enabling NRC to track the various building performance metrics necessary to better manage real property assets throughout the building life cycle.
- NRC continued to build key international relationships within targeted economies, including emerging markets as well as leaders in R&D and technology – further described under "Internal Services".
- In 2011-12, NRC statutory revenues increased by $21.5M (or 27.8%) to $98.9M while salary and operations expenditures (including statutory expenditures) were reduced by $47.8M (or 8.5%) to $514.6M.

Risk Analysis

In 2011-12, NRC faced significant shifts internally and externally. While going through its internal re-focusing towards becoming a more effective and industry-oriented organization, NRC also dealt with a number of externally-driven events. The organization was a key point of focus for results released around national studies on Canada's innovation performance such as initiatives driven by the [4] Science, Technology & Innovation Council and an [5] expert panel Review of Federal Support to Research and Development. The federal budget commitments for 2012-13 responded to these studies, directing a stronger NRC focus to support industry-driven research interests. This path is consistent with NRC's current strategic directions and goals. NRC also underwent the launch of Shared Services Canada (SSC) and operated its business within the context of continued global economic instability.

NRC progress made in 2011-12 against each risk management commitment in its Corporate Risk Profile is highlighted below:

Focus on outcomes and impact: *Ensure that the supporting processes and activities for NRC's strategic direction are focused on enabling it to deliver on its outcomes and impact.* This action addresses high risks identified in 2010 related to such issues as funding and financial pressures during a period of economic constraint, organizational agility and balancing client responsiveness with federal accountability requirements, managing workload capacity at a time of change, and recruiting highly qualified people. To support this commitment:

- NRC began re-orienting its research activity into programs, reflecting relevant industry alignment, to support service delivery under its new business model. As of 1 April 2012, NRC refocused 50% of its programs for greater industry orientation.
- A new Program and Project Services group was established to help manage NRC programs more consistently on a lifecycle basis with clear milestones and review points for continuity. The group established documented guidelines and tools and held training sessions to support this.
- A new Corporate Performance Management Framework was developed to reflect NRC's enhanced client- and revenue-orientation and focus.
- New corporate processes (and related training) around financial management and client relationship management were also defined.

Define and manage change: *Define requirements and build into NRC re-focusing plan including organizational structure/process/people considerations and strong supporting communications.* This action addresses high risks around such issues as: properly managing the required changes for refocusing NRC, NRC having the right business skillsets, sustaining and building stakeholder support, and recruiting highly qualified people. To support this commitment:

- A workshop took place in December 2011 to map key milestones by function, the results of which led to the establishment of a team to effectively manage required business changes to the end of the fiscal year, including leads designated to implement and manage efforts around employee and manager engagement.
- An external campaign was undertaken (September 2011 to March 2012) to build awareness of NRC solutions for industry.
- An internal communications campaign ("Reaching for New Heights") was also launched to build employee engagement, including more frequent communications on refocusing efforts to staff, intranet postings, and visible posters.

Build leadership capabilities and engagement: *Develop and prepare leaders to manage the changes required, including stakeholder relationships and effective decision-making to prioritize needs.* This action addresses high risks around such issues as funding and financial pressures, managing organizational and culture change, organizational agility to balance client interests and accountability requirements, stakeholder support, and recruiting highly qualified people. Several initiatives already mentioned above contribute here, including management training around new corporate processes, and designation of leads to undertake activities towards enhancing manager engagement. Others include:

- Meetings involving all managers with the senior executive team to discuss issues and opportunities as NRC re-focuses (October 2011, February 2012).
- Regular release of progress updates to managers and newsletters from the President.
- Implementation of the Commitment To Excellence program and related training to manage employee performance.
- Work to optimize NRC's integrated risk management framework and approach to better support confident and innovative decision-making at NRC.

The renewed innovation focus nationally has presented an important opportunity for NRC that reaffirms its strategic direction and value to Canada through closer industry alignment.

Summary of Performance

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities*	Actual Spending**
690.8	820.9	698.5

* The Total Authorities includes Planned Spending, amounts from Budget 2011, amounts from Supplementary Estimates, and other statutory authorities.
** Except where noted otherwise, all financial results are reported on a cash accounting basis for historical comparability.

2011-12 Human Resources (Full Time Equivalents (FTEs))

Planned	Actual	Difference
3,743	4,093	350*

* The methodology used to estimate planned Full Time Equivalent (FTE) does not necessarily permit comparison with actual utilization. NRC has changed its FTE calculation methodology for the 2012-13 reporting cycle.

Summary of Performance Tables

The Planned Spending amount of $690.8M represents the best estimate of spending at the time the Main Estimates were prepared, which was prior to the budget and the start of the fiscal year.

Total Authorities vs Planned Spending (Total Difference of $130.1M)
The Total Authorities amount includes the Planned Spending and all items subsequently approved (e.g. Supplementary Estimates) and reflects authorities available at the end of the fiscal year. The variance of $130.1M between Planned Spending and Total Authorities is mainly due to the additional funding received in-year through the 2011-12 Supplementary Estimates, the statutory revenue carry forward not being reflected in the Planned Spending, and the increases in statutory authorities.

Voted Authorities (Difference of $48.3M): Significant funding received through the 2011-12 Supplementary Estimates includes funding of $19.4M for the [6] Digital Technologies Adoption Pilot Program (DTAPP), $6.0M for the renewal of the [7] Genomics Research and Development Initiative (GRDI), $3.0M for the

[8] Canadian HIV Technology Development (CHTD) Program and other items totaling $3.1M. Other increases to voted authorities received from Treasury Board Secretariat included eligible paylists expenditures of $13.9M, collective agreements of $8.4M, a capital carry forward authority of $3.3M and other items of $0.1M. These increases were offset by a decrease to authorities of $8.8M transferred to Shared Services Canada.

Statutory Authorities (Difference of $81.8M): In comparison to Planned Spending, statutory authorities are higher by $8.8M for employee benefit plan, by $71.9M for statutory revenue authorities (pursuant to paragraph 5(1)(e) of the [1] *National Research Council Act* the NRC has authority to expend revenues it has received through the conduct of its operations) and by $1.1M for other adjustments. The $71.9M consists of $48.0M from the revenue carry forward and $23.9M for increased revenue received throughout 2011-12.

Total Authorities vs Actual Spending

The $122.4M difference between the Total Authorities and the Actual Spending consists of unspent funding of $6.9M from capital lapses and $1.1M in operating lapses which will all be carried forward to 2012-13, lapses of $17.3M in transfer payments, frozen operating expenditures of $0.4M and $96.7M from unspent statutory revenues (including crown assets proceeds).

Progress Toward Strategic Outcome 1

Strategic Outcome 1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas		
Performance Indicators	**Targets**	**2011-12 Performance***
Average incremental number of new and improved client products as a result of NRC's R&D activities compared to non-clients	0.6 by March 2012	Information on the number of new and improved client products could not be collected. However, average incremental sales resulting from new and improved client products is estimated to have increased from $320,000 in 2010-11 to $335,000 in 2011-12.
Average incremental client R&D expenditures as a result of NRC's R&D activities compared to non-clients	$75,000 by March 2012	Average incremental client R&D expenditures as a result of NRC's R&D activities have increased from an estimated $150,000 in 2010-11 to $160,000 in 2011-12.
Average incremental client R&D full-time equivalents employed as a result of NRC's R&D activities compared to non-clients	1.2 by March 2012	Average incremental client R&D full-time equivalents employed as a result of NRC's R&D activities is estimated to have increased from 1.2 FTEs in 2010-11 to 1.3 FTEs in 2011-12.

* These performance results are conservatively estimated based on extrapolated results from recent evaluations of NRC's largest program, specifically of NRC-IRAP.

Performance Summary for Strategic Outcome 1

Program Activity	**2010-11 Actual Spending ($ millions)**	**2011-12 ($ millions)**				**Alignment to Government of Canada Outcomes**
		Main Estimates	**Planned Spending**	**Total Authorities***	**Actual Spending***	
Manufacturing Technologies	128.6	126.6	126.6	154.7	111.8	Strong Economic Growth
Information and Communications	77.2	69.5	69.5	76.7	69.1	Strong Economic Growth

Technologies and Emerging Technologies						
Industrial Research Assistance	286.2	139.1	139.1	165.9	146.3	Strong Economic Growth
Health and Life Science Technologies	115.1	92.8	92.8	122.9	102.9	Healthy Canadians
Energy and Environmental Technologies	36.5	34.6	34.6	47.4	30.0	A Clean and Healthy Environment
Total	**643.6**	**462.6**	**462.6**	**567.6**	**460.1****	

* Excludes amount deemed appropriated to shared Services Canada.

** NRC spent less than total authorities. The majority of the unspent balance relates to statutory revenues carried forward to 2012-13.

Progress Toward Strategic Outcome 2

Strategic Outcome 2: Canadians have access to research and development information and infrastructure		
Performance Indicator	**Target**	**2011-12 Performance**
Proportion of surveyed S&T infrastructure users who report positively on the value of the NRC infrastructure used	85% by March 2012	During this year of re-focusing, NRC did not undertake a client feedback exercise. In 2010-11, NRC reported client satisfaction at 93%. This, combined with steadily increasing revenues reported in 2011-12, is evidence of ongoing client satisfaction. Further indicators are given below in individual discussions of Program Activity Performance.*

* In 2012-13, NRC will have a new client feedback mechanism in place, aligned with its program-based management model. At that time, it will use 2010-11 client satisfaction results as a baseline.

Performance Summary for Strategic Outcome 2

Program Activity	**2010-11 Actual Spending ($ millions)**	**2011-12 ($ millions)**				**Alignment to Government of Canada Outcomes**
		Main Estimates	**Planned Spending**	**Total Authorities***	**Actual Spending***	
National Science and Technology Infrastructure	98.6	92.0	92.0	100.1	96.4	An Innovative and Knowledge-based Economy
Scientific, Technical and Medical Information	33.6	13.2	13.2	18.9	18.1	An Innovative and Knowledge-based Economy
Total	**132.2**	**105.2**	**105.2**	**119.0**	**114.5**	

* Excludes amount deemed appropriated to shared Services Canada.

Performance Summary for Internal Services

Program Activity	**2010-11 Actual Spending ($ millions)**	**2011-12 ($ millions)**			
		Main Estimates	**Planned Spending**	**Total Authorities***	**Actual Spending***
Internal Services	127.6	123.0	123.0	134.3	123.9

* Excludes amount deemed appropriated to shared Services Canada.

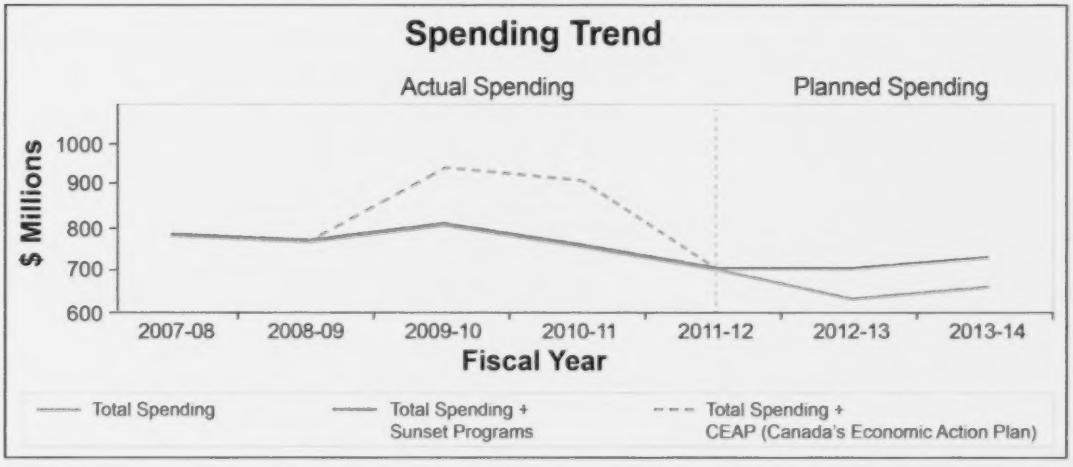
Strategic Environmental Assessment

During 2011-12, NRC considered the environmental effects of initiatives subject to the [9] *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The Directive applied to two initiatives: the Digital Technology Adoption Pilot Program (DTAPP), and Adoption of Information and Communications Technologies – the National Research Council Canada's Industrial Research Assistance Program (NRC-IRAP). Through the strategic environmental assessment process, departmental initiatives were not found to have any positive or negative environmental effects.

Expenditure Profile

Departmental Spending Trend

NRC's actual spending for 2011-12 is $698.5M, representing 85.1% of its total authorities. Over the past three years (2009-10 to 2011-12), actual spending has averaged $844.3M, a decrease of $19.7M when compared to prior year's 3-year average (2008-09 to 2010-11). In comparison to the prior year, actual spending decreased by $204.9M. Lower spending in 2011-12 is primarily due to the sun-setting of funds received for [10] Canada's Economic Action Plan (EAP). NRC's actual spending under the EAP in 2010-11 totalled $158.7M with $143.9M in transfer payments, $10.1M in capital expenditures and $4.7M in operating expenditures. During 2011-12, NRC has continued to take budgetary measures to meet the Budget 2010 operating freeze. Furthermore, NRC has implemented the final reduction from the 2008 Strategic Review which resulted in lower expenditures in 2011-12.



Estimates by Vote

For information on NRC's organizational Votes and/or statutory expenditures, please see the Public Accounts of Canada 2012 (Volume II). An electronic version of the Public Accounts 2012 is available on the [11] Public Works and Government Services Canada's web site.

Section II: Analysis of Program Activities by Strategic Outcome

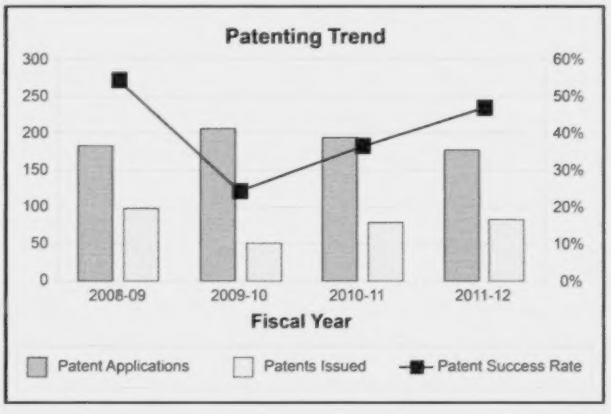
Strategic Outcome 1

Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas

NRC as Research Partner – The value and relevance of NRC's research and supporting activities is evidenced by partner investments in collaborative research projects. In 2011-12, revenues earned for joint research projects totaled $24.2M.

The federal S&T Strategy commits to translating research into innovative, technology-driven products and services in national priority areas as well as improving the innovation capacity of industry. NRC delivered on these commitments through Strategic Outcome 1 by developing and deploying technologies targeting the innovation needs of Canadians and communities. Solutions were developed for key industrial sectors to meet national and global market interests, enhancing their competitiveness and contributing to Canada's longer-term prosperity. Resources were provided to SMEs to help them engage in research and development activities and compete more effectively in world markets. To support improvement of quality of life in specific priority areas (health and wellness, clean environment, and the sustainable development of Canada's natural resources), NRC collaborated with other government departments, academia and industry, making important contributions towards solutions for the benefit of Canadians.

Data from the study, *S&T Economic Impacts and Return on Investments (2012),* indicated that NRC provides services to a large number of firms annually through its various S&T activities. Between 1997 and 2008 over 17,000 Canadian private sector clients benefited from NRC's assistance. They were, on average, small to medium-sized companies with about $17M in annual sales and approximately 80 employees. The majority, close to 90% of clients, had fewer than 100 employees, with 60% of firms having fewer than 20 employees. They conducted, on average, $860K in R&D with an average of about 8 R&D employees and about $3.0M in exports sales annually. They exhibited particularly strong growth in sales, R&D and employment, when compared to non-clients.



Patent success ratio (PSR) is a measure of innovation efficiency that has been found to be moderately correlated with economic growth when applied at the national level.[2] During the past four years, NRC developed new technologies for industries from which arose a total of 760 patent applications. During this period, 311 patents were awarded to NRC, giving a PSR of 41% compared to

[2] McAleer, Michael and Slottje, Daniel. A new measure of innovation: The patent success ratio. Scientometrics 63 (3) 2005, pp. 421-429.

33% during the previous four years. These figures reflect NRC's success at focusing its intellectual property portfolio. NRC has also increasingly been basing application preparation by a patentability and market assessment, drafting applications internally, and then working closely with identified recipients of technology throughout the planning and execution phases of innovation projects.

Program Activity 1.1: Manufacturing Technologies

Program Activity Description: *This program performs multi-disciplinary research and development in consultation with industry, universities, government departments and other key innovation players to improve the global competitiveness of Canadian industry by transforming knowledge and innovation into real economic value and by transferring technologies into industrial solutions for the marketplace. Companies have coordinated access to NRC's multidisciplinary research expertise and state-of-the art facilities to ensure they are at the leading edge of innovation. This includes a facility that transforms concepts into custom precision mechanical prototypes for research applications.*

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
126.6	154.7	111.8

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
984	1,048	64

Program Activity Performance Summary

Expected Result	Performance Indicator	Target	Actual Result
Manufacturing industries in Canada have coordinated access to NRC's multidisciplinary research expertise and state-of-the art facilities to ensure they are at the leading edge of innovation	Percentage of surveyed clients who report that NRC's manufacturing technologies research and facilities helped advance their innovation capacity	75% by March 2012	In 2010-11, NRC reported client satisfaction at 73%. These results will be used as a baseline as NRC implements its new client feedback mechanism in 2012-13. Of clients served in 2011-12, 54% were customers returning at least once since 2009-10 and 2010-11. NRC's success in attracting "paying clients" speaks positively to the perceived value of NRC innovative contributions.*

* Data is restricted to paying customers.

Performance Summary and Analysis of Program Activity

Canada's manufacturing sector is of continuing significant importance for Canada as it contributes approximately 13% of total GDP and supports job creation and the overall standard of living for Canadians. After a strong decline in 2007-08, economic activities in manufacturing have recovered and increased since 2010. In 2011, the growth rate for manufacturing was above the total GDP growth rate, with a sales growth of 7.8% vs. GDP growth rate of 2.4%. Canada's manufacturing sector is expected to remain strong, and demand for key Canadian exports such as autos and machinery should continue at a high level. In recent months, approximately one in five manufacturers hired additional staff

which led to a net job creation in this sector and grew the total number of Canadians employed in this sector to almost 1.5 million in 2011.

NRC helped to strengthen this sector through research consortia with companies and industry, contributing to the development and adoption of new, more competitive technologies. NRC's statutory revenue for this program activity increased 30% from that of 2010-11 (from $32.4M in 2010-11 to $42.3M in 2011-12), driven largely by increases in technical services for the construction sector and in materials and manufacturing, as well as collaborative research with over 75 industries in materials and manufacturing. 3,462 customers (39% increase from 2010-11) were served through the sale of goods, and 2,525 customers (68% increase from 2010-11) received technical services. While there were revenue increases from all client types, the largest increases in revenue came from industry (13%), and from the construction sector, in particular.

In 2011-12, NRC focused its aerospace efforts on advances in alternative fuels, light-weight materials, aerodynamic designs, and performance efficiencies, increasing its number of partners to 246. Recent highlights for aerospace innovation include the launch of a world class [12] aircraft engine icing testing and certification facility (GLACIER), the evaluation of alternative fuels for aerospace, and the development of advanced coatings for high temperature aircraft engines and advanced thermal spray coatings to apply to gears. These coatings, developed in collaboration with industry partners, allow engines to burn fuel at considerably higher temperatures, leading to cleaner and more efficient combustion and decreased fuel use.

Icing systems for engine research – NRC provided technical assistance to the Global Aerospace Centre for Icing and Environmental Research (GLACIER) in Manitoba by developing and successfully installing two icing systems – key components of the facility. The Centre is considered a global leader in cold weather research on Aerospace Gas Turbine engines. As part of GLACIER (a joint venture between Rolls-Royce Canada Limited and Pratt & Whitney), NRC partnered with MDS Aerotest (a Canadian SME) to support testing, certification, and technology development for advanced aerospace engine designs.

To foster Canada's innovative capabilities in the automotive sector, NRC strengthened the role of Canadian companies by conducting and supporting technology development in [13] light-weight materials, industrial biomaterials, and alternative propulsion systems, as well as in advanced manufacturing & design systems. When incorporated into vehicles, these lighter materials contribute to reducing overall vehicle weight and improve fuel efficiency as well as durability, leading to lower CO_2 emission, reduced wear and increased safety. To that effect, NRC secured the second phase of an R&D collaborative agreement with Magna Exteriors & Interiors (MEI) covering work until March 2013 on the development of parts made using direct long-fibre thermoplastic composites (DLFT) technology, the latest technology in the

International partnership to develop electric vehicles – Aligning with the federal initiative "Automotive Partnership Canada", NRC helped commercialize Canadian electric vehicle technologies through a continuing memorandum of understanding between NRC and China's Jiangsu Aoxin New Energy Automobile Co., Ltd. (Aoxin) which was signed on November 12, 2010. The international partnership worked towards the more than one million highway-capable, plug-in electric vehicles and hybrid-electric vehicles estimated to be on Canadian roads by 2018 and the $23B-$60B estimated market in China for electric vehicle batteries by 2030.

manufacturing of polymer composite materials. This agreement was also instrumental in the recent announcement of a major investment made by the Centre for Research and Innovation in the Bio-Economy (CRIBE) with MEI in a project to integrate wood fibres in auto parts. This initiative will help create jobs in the automotive, pulp and paper and packaging industries.

In 2011-12, NRC's construction sector research partners increased by 25%. NRC's R&D activities focused on the use of bio-materials in residential and commercial buildings, as well as intelligent sensor systems controlling light, ventilation, heating and air conditioning systems in order to minimize energy use without decreasing indoor comfort. NRC scientists have published several articles to that effect.[3] A special indoor environment program was also developed to focus on improving air quality.

NRC played a national leadership role in the development of model building, energy, fire, and plumbing codes for the safety of all Canadians. The NRC Building Codes are a major tool supporting the Canadian construction industry and the safety of Canadian consumers. In 2011-12, NRC focused on the rapid dissemination of the new National Model Construction Codes to stakeholders across the country, and also released the [14] National Energy Code of Canada for Buildings which is estimated to help buildings become up to 25% more energy efficient.

2011 National Energy Code of Canada: Helping Canadians build greener – NRC contributed to the 245 technical changes made to the 2011 National Energy Code of Canada for Buildings, which accommodates new technologies and construction practices that have emerged in Canada in the past 15 years. This Code, which covers requirements for design and construction of the building envelope, systems and equipment for heating, ventilation and air-conditioning, service water heating, light, and the provision of electrical power systems and motors, will significantly reduce costs in energy for buildings.

More information on Manufacturing Technologies can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

NRC recognized that it could further improve integration between multidisciplinary fields and within different divisions. As part of its re-focusing, NRC launched a stage-gate process to ensure that its programs are developed on sound understanding of industry value chains.

Program Activity 1.2: Information and Communications Technologies (ICT) and Emerging Technologies

Program Activity Description: *In support of the federal S&T Strategy, this program mobilizes and partners with key university, government and private sector players and forms major research collaborations to develop integrated research solutions in the areas of information and*

[3] "A comparison of four methods to evaluate the effect of a utility residential air-conditioner load control program on peak electricity use". Energy Policy, 39 (10) 2011, pp. 6376-6389; and "The Effect of household characteristics on total and peak electricity use in the summer". Energy Studies Review, 18 (1) 2011, pp. 20-33.

communications technologies and emerging technologies for the economic benefit of industrial sectors and Canadians generally. Areas of research focus include photonics, molecular science, information technology and enabling sustainable development.

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
69.5	76.7	69.1

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
396	456	60

Program Activity Performance Summary

Expected Result	Performance Indicators	Targets	Actual Results
Advancements in innovative technology solutions in emerging and ICT sectors	Revenue from service contracts and successful Intellectual Property (IP) transferred to emerging industry sectors	$2.0M by March 2012	$4.5M
	Percentage of clients reporting positively on the impact of NRC R&D on client growth	85% by March 2012	In 2010-11 NRC reported client satisfaction at 88%. These results will be used as a baseline as NRC implements its new client feedback mechanism in 2012-13.

Performance Summary and Analysis of Program Activity

The ICT industry in Canada weathered the economic uncertainty and emerged as one of Canada's most robust sectors with a steady client base. In 2011-12, NRC worked with 95 unique clients and responded to industry demand by increasing its services in areas such as photonics fabrication and the integration and assembly of devices at the prototype stage. Licensing revenues and industrial collaborations showed increases, with a slight decrease in the use of NRC's Industrial Partnership Facilities in this sector. NRC made major strides in ICT research, as 32 patents were filed and 11 patents were issued. Overall statutory revenues from industry were $12.3M, including $1.7M for licensing of technologies.

In spite of the economic slow-down, photonics in Canada, a particularly strong subset of ICT, made major advances, increasing its R&D staff and diversifying into new areas such as security, energy and defence, and human health. A study over the period 2008-12[4] reported that three-quarters of Canadian photonics companies increased revenues during the period with an average compound annual growth rate (CAGR) of 7%, and that the communications sector continued to be robust, with some of the fastest growing companies. The leading role played by NRC's Canadian Photonics Fabrication Centre (NRC-CPFC) in driving photonics in Canada (particularly in Ontario) was recognized by the study, and NRC broadened its range of services and added capacity in order to accommodate client demand.

[4] Report prepared for the Canadian Institute for Photonic Innovations.

Canadian companies gain access to latest microscopes – NRC's National Institute for Nanotechnology (NINT) in Edmonton officially opened the Hitachi Electron Microscopy Product Centre (HEMiC) in July 2011, allowing Canadian firms to access some of the world's best microscopy expertise and equipment, including an environmental transmission electron microscope that can capture chemical reactions at the atomic level as they happen. HEMiC, a $15M collaboration between NINT and Hitachi High Technologies, offers important new electron microscopy research equipment and capabilities to Canada's industrial and academic communities. Supported by Hitachi High Technologies, NRC, the Alberta government and the University of Alberta, the Centre supports the development, evaluation and commercialization of NINT microscope innovations. HEMiC offers clients contract-based access to researchers with a range of powerful imaging tools and techniques. At the same time, Hitachi has access to NINT scientists and engineers who assist in developing new Hitachi product features, while NINT gains priority access to new tools and techniques from Hitachi, ensuring a solid channel to market for NINT's new electron microscope and electron beam technologies. As a result of the Centre, NINT has designed and started providing for sale original equipment manufacturer (OEM) sample holders to Hitachi High Technologies Canada in tandem with the electron microscopy equipment they sell.

NRC's most significant contributions in photonics focused on three areas of photonic hardware development: advanced photonic components for optical communications, gallium nitride electronics, and photonic imaging devices for defence and security. Projects included: Development of complex high speed photonic integrated circuits, capable of meeting the needs of companies focused on coherent communications, the next wave of optical communications required to meet the growing bandwidth requirements of mobile networks; a Gallium Nitride semiconductor design kit, allowing companies to design and fabricate denser electronic devices requiring less energy than conventional silicon devices and hence reducing greenhouse gases; and high resolution infrared imaging devices that can be used in manufacturing, food inspection, mine exploration, crop analysis, and defence and security.

GaN Systems Inc. receives venture capital funding – In November 2011, GaN Systems Inc. of Ottawa, a semiconductor manufacturer, received first round funding from Chrysalix Energy Venture Capital and Rockport Capital based on a technology developed with NRC and the Ontario Centres of Excellence. The technology targets more energy-efficient and lower-cost electronic products and renewable energy solutions by overcoming the speed, temperature and power handling limitations of traditional silicon power conversion approaches. Building on gallium nitride process research at the NRC, the technology is used in highly efficient, low-loss diodes, transistors and integrated systems, enabling power devices that are typically four times smaller, more efficient and less costly than the current standard.

NRC leveraged an interdisciplinary team to reveal the unique nanoscale properties of engineered materials and nature's own biological materials and to understand how these could be developed for sectoral applications, from nano-inks for electronics to biomarkers for drug screening.

In 2011-12, important milestones were achieved toward the ultimate goal of an intelligent building management system to tailor the delivery of building services including lighting, temperature and ventilation, as well as monitoring and responding cost-effectively to airborne pollutants such as formaldehyde and radon. The system will improve decision-making processes leading to greater energy efficiency, a healthier indoor environment and effective integration with future Smart Grid technologies. In particular, in collaboration with industry, whole-building technologies were successfully deployed in three commercial buildings in the Greater Toronto Area to assess the effectiveness of the technology in

helping energy management companies and building owners make decisions to reduce the amount, and cost, of energy consumed during peak periods. This field trial and validation study is a precursor to commercialization which is scheduled for 2013. Additionally, in collaboration with Natural Resources Canada (NRCan-Varennes), major advances were made to develop data-driven models that represent the behaviour of major heating, ventilation and air conditioning (HVAC) components such as air-handling units and chillers. These models form the basis of a tool that will look at a forecast, and be able to suggest the best ways to reduce future load during peak periods.

NRC helps grow nanotube industry – In February 2011, Raymor Industries installed and commissioned a new unit for the production of single-wall carbon nanotubes (SWNT) based on a technology jointly developed and licenced by the NRC and the University of Sherbrooke. NRC worked closely with Raymor to solve several problems associated with the powder feeder and to optimize the quality of the material produced. The work permitted improvements in the stability and reproducibility of the process which are key factors for the successful commercialization of SWNT. According to the Quebec-based company, "The activities of Raymor in the field of production of SWNT have created 4 new full time jobs and have strongly contributed to the maintenance of 3 other full time jobs." Raymor has embarked on commercialization efforts worldwide in order to become the Global leader in the SWNT production. They now have distributors in South Korea, Japan and India and negotiations are underway for distribution agreements in Taiwan, China and Europe.

More information on Information and Communications Technologies (ICT) and Emerging Technologies can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

A review of Canada's ICT sector found that Canada ranks only 10th in the OECD for the level of business-performed ICT R&D, and its spending represents only 2.9% of total investments. In the aftermath of the telecommunications market downturn one decade ago, the Canadian industry became fragmented, some manufacturing shifted to offshore locations, and large players vanished. NRC has the largest concentration of expertise and facilities for photonic device, photonics materials, and semiconductor manufacturing in the country. It assisted Canada in re-establishing its leadership in the sector. NRC redirected its component development and manufacturing capabilities to work more closely with industries through more targeted technology-development activities, particularly at the critical interface between proof-of-concept demonstrations and commercially viable manufacturing process development.

Program Activity 1.3: Industrial Research Assistance

Program Activity Description: *This program provides a range of technical and business-oriented advisory services, as well as financial support for small and medium-sized (SME) Canadian businesses engaged in research and development of technological innovations. The program is important for enabling enterprises to generate significant economic activity for Canadian industry by augmenting the capacity and capability of enterprises to innovate and commercialize. Financial support is provided through a transfer payment program delivered by a cross-Canada network of more than 250 professionals, including over 230 Industrial Technology Advisors (ITAs), and located in approximately 100 communities. The field staff of professionals, recognized for their scientific, technical, engineering, business expertise, and knowledge of SMEs, provides clients with*

customized value-added advice, information, referrals and financial assistance. They work with clients at all stages of the innovation – commercialization continuum, including: project development; access to technical assistance, financial, business, marketing or management advice; access to competitive technical information; patent searches; and access to local, regional, national or international linkages. NRC-IRAP Innovation Network Advisors (INAs) represent and promote NRC-IRAP in the community innovation system and build effective regional innovation system relationships for the benefit of SMEs. This includes working with organizations that receive NRC-IRAP contributions as well as with other organizations to facilitate the implementation of multi-sector, multi-partner initiatives that are relevant to SMEs regionally and nationally. As well, the program supports the placement of graduates in SMEs through its participation in the delivery of Human Resources and Social Development Canada's Youth Employment Strategy (YES).

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
139.1	165.9	146.3*

* The difference between the total authorities and the actual spending is principally due to the year-end lapse in the DTAPP contribution budget for NRC-IRAP.

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
374	355	(19)

Program Activity Performance Summary

Expected Result	Performance Indicators	Targets	Actual Results
SMEs in Canada have merit-based access to effective and efficient innovation support resulting in increased wealth	Average return in dollars to the Canadian economy (i.e. wealth creation in terms of increased sales and decreased cost) per dollar of Program cost	$7 by March 2013	$11
	Number of SMEs financially supported	600 by March 2012	1,811
	Number of jobs financially supported	2,500 by March 2012	6,492

Performance Summary and Analysis of Program Activity

NRC-IRAP helped Canadian SMEs successfully commercialize technologies through the provision of technical and business advisory services to support their R&D and other innovation-related activities. An analysis of feedback collected through the newly-implemented Post-Project Assessment tool indicated that 331 clients had completed funded projects (totalling $34M) between June 14, 2010 and January 17, 2012, and that NRC-IRAP made a positive contribution to many factors critical to the success of technologically innovative projects. Furthermore, the advisory services provided were found to be very helpful to the firms and NRC-IRAP's ITAs were perceived to be both professional and competent. NRC-IRAP's success in providing SMEs with access to needed services, encouraging collaborations with other programs, organizations and levels of government, and building effective regional/community innovation systems was also corroborated by the [16] expert panel Review of Federal Support to Research and Development. That report highlighted NRC-IRAP's "proven track record of facilitating innovation by SMEs throughout Canada" and noted that "IRAP was widely praised [during extensive

consultations] as an effective, well-run program that provides industry with non-repayable contributions, mentorship and technical business advice."

The Draft Report for the Evaluation[5] of NRC-IRAP states that the majority of NRC-IRAP clients have increased their innovation capacity through the guidance of ITAs, the financial support provided by the Program, and/or the services provided by funded organizations. Over the period 2007-08 to 2011-12, NRC-IRAP was successful in assisting approximately 5,000 recipient SMEs to use their innovation capacity (e.g., skills, knowledge and personnel) to increase their firm's productivity and to enable them to move new products and technologies towards commercial success. The economic analyses conducted as part of the evaluation estimated a positive return on investment, with a benefit-cost ratio of over 11:1, consistent with the results from the previous evaluation of the Program. In fact, NRC-IRAP was found to result in estimated annual profits of $440M for client SMEs and was credited with significant extrapolated labour force outcomes, including direct employment increases of between 6,900 to 10,200 employees, of which approximately 6,700 are R&D positions.

In 2011-12, SME needs and the demand for NRC-IRAP financial assistance and services continued to grow. As part of the Government of Canada's Digital Economy Strategy, the federal Budget 2011 provided $80M over three years to NRC-IRAP to accelerate the adoption of digital technologies to increase the productivity and competitiveness of SMEs across Canada and in all sectors. In 2011-12, the first year of the Digital Technology Adoption Pilot Program (DTAPP), NRC-IRAP contributed $1.3M to firms, $0.4M to colleges, and $0.6M to not-for-profit organizations. Additional performance metrics have been established for performance reporting in 2012-13.

A Rising Star – Ostara Nutrient Recovery Technologies Inc. designs, builds and sells water treatment systems that remove phosphorus and nitrogen from municipal wastewater and produce a revenue-generating, environmentally friendly fertilizer known as Crystal Green®. The company would not exist today without the original market study supported by NRC-IRAP. After the completion of the market analysis, Ostara operated its first successful pilot plant in Edmonton. Within two years, the company scaled up the technology by a factor of 100, and constructed and commissioned a full-scale demonstration reactor in 2007 at Edmonton's wastewater treatment plant. Ostara then built nutrient recovery facilities at three U.S. municipalities. The global market for Ostara holds enormous potential because the beneficiaries of its technology are numerous. The world environment is one, since excess phosphorus and nitrogen released into waterways from wastewater streams and from fertilizer leaching and runoff can slowly kill lakes and rivers by promoting algae growth that depletes the water's oxygen supply. Since NRC-IRAP's initial involvement with Ostara, revenues have grown 50% to 100% every year since 2009, the company has hired 34 people and remains the strongest player in its market, attracting private investors and, drawing nearly $2M in seed financing with its first NRC-IRAP-funded market study.

As Canada's national contact point, NRC has begun to build relationships with important international markets, technology leaders and target economies to offer Canadian firms a new advantage in accessing European expertise and markets. This is expected to increase Canada's competitiveness by offering Canadian companies a new advantage to access global value chains. NRC-IRAP supported these efforts by initiatiating a framework to

[5] Posting of Report pending.

deliver on Canada's commitment relating to SME engagement in [17] EUREKA, a network raising the productivity and competitiveness of European businesses through technology. In 2011-12, NRC-IRAP formed an International Networks Team (INT), with representation from all NRC-IRAP regions and relevant stakeholders including NRC's International Relations Office and the Department of Foreign Affairs and International Trade.

INT's objective was to assist the Program in identifying countries and international regions of strategic interest for partnering with other organizations to leverage global opportunities for Canadian SMEs. In this regard, current dialogue on potential collaborative frameworks were engaged with Israel, Australia, Mexico, Ireland and several member countries of the EUREKA community in the context of IRAP's global reputation as a best practice in supporting the innovation activities of SMEs. The European Commission has recently stated a desire to establish a Europe-wide SME support program modelled on NRC-IRAP.

More information on Industrial Research Assistance can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

NRC-IRAP's strength is in the delivery of innovation services and funding to SME clients. NRC-IRAP is perceived by clients as efficient and creating minimum red tape. With the launch of DTAPP, NRC-IRAP was asked to obtain from clients numerous data and pieces of information that created a substantial burden on clients and field staff. In the future, NRC-IRAP will work closely with key government stakeholders to ensure that that new programs and services will be designed to minimize red tape for clients.

Program Activity 1.4: Health and Life Science Technologies

Program Activity Description: *In support of the federal S&T Strategy, this program mobilizes and partners with key university, government and private sector players, and forms major research collaborations to develop integrated research solutions for complex health and related life science issues for the benefit of Canadians. Areas of research focus include age-related and infectious diseases, human health and wellness, and the prevention, early diagnosis and improved treatment of diseases such as cancer.*

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
92.8	122.9	102.9

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
695	854	159

Program Activity Performance Summary

Expected Result	Performance Indicators	Targets	Actual Results
Canadian health	Revenue from successful	$5M by	$5.16M

Expected Result	Performance Indicators	Targets	Actual Results
and life science industries have greater access to effective and innovative technology solutions	IP transferred to health and life science industries	March 2012	
	Percentage of respondents from the health and life science industrial collaborators who respond positively on value of NRC innovative contributions	85% by March 2012	In 2010-11, NRC reported client satisfaction at 91%. These results will be used as a baseline as NRC implements its new client feedback mechanism in 2012-13. In the absence of survey data from clients, NRC's success in attracting "paying clients" speaks positively to the perceived value of NRC innovative contributions.

Performance Summary and Analysis of Program Activity

Over the past three years, the total value of health and life science technology-related partnerships amounted to $89M. Despite the economic downturn, NRC's statutory revenue for this program activity increased by 11.8%, generating $18.9M in 2011-12 from 214 clients, of which the majority were returning clients who accounted for 96% of the total revenue. Such a high number of returning clients is strong evidence of their level of satisfaction. These increases followed a three year positive trend.

NRC R&D related to the diagnosis and treatment of cancer was an area of focus in 2011-12, with highlights including:

- NRC negotiation with two Canadian companies to license a Multiple Survival Screening algorithm, which provides a robust set of predictive markers to accurately identify breast cancer patients who might not respond to treatment with a commonly used chemotherapeutic agent, Paclitaxel (Taxol);
- A discovery by NRC researchers that has resulted in a new drug candidate being developed by Helix BioPharma to harness attacking cancer cells;
- A humanized IgG2 monoclonal antibody, discovered by NRC shown to inhibit tumour growth, was licensed by Alethia Biotherapeutics, and NRC is providing additional support to help the firm reach its commercialization goals.

In 2011-12, NRC also worked with collaborators to develop integrated technological solutions for medical conditions facing Canadians. This included the development of unique assays and models, used by industry to identify lead compounds, and understand mechanism of action, for their potential to prevent or treat neurological disorders. Examples included NRC partner and incubating company Neurodyn, which recently completed its animal studies on a lead product and is working to move it along the regulatory and commercialization continuum to commercialize its ginseng extract as a natural product for Parkinson's sufferers.

NeuroTouch Team: Public Service Award of Excellence for Innovation – Dr. David Clarke made history by successfully removing a brain tumour after performing the world's first virtual-craniotomy surgery using NeuroTouch, a virtual-reality simulator developed by NRC, and an innovative tool that will have a profound effect on the way neurosurgeons are trained and make brain surgery safer for countless patients. The computerized brain provides a realistic representation of a patient's brain, allowing a three-dimensional and touch-sensitive simulation, shows a pulse, with realistic blood vessels, and has a "texture" that the surgeon experiences through a feeling of resistance. Developing the virtual-reality simulator was a team effort which received the [18] Public Service Award of Excellence in June 2011, with collaborations among over 50 researchers and surgeons from coast to coast and also NRC's Genomics and Health Initiative. NRC and all Canadians can be proud that the efforts of NRC's NeuroTouch Team have revolutionized neurosurgery training for years to come.

Over the last year, NRC has built and strengthened relationships with key stakeholders in the agriculture biotechnology sector. NRC, Agriculture and Agri-Food Canada (AAFC), Genome Prairie and three Canadian companies partnered on "Prairie Gold", a $4.5M initiative, to commercialize the industrial oilseed crop lines of *Camelina sativa* (false flax) and *Brassica carinata* (Ethiopian mustard). The ongoing project developed specialized crop varieties with optimal oil profiles for use as high-value industrial feedstocks. Additional benefits to Canadian farmers included: valuable rotation crops, the ability to grow a high-value crop on marginal land and the development of meal by-products to supplement animal feed. Agrisoma Biosciences Inc., one of the small Canadian companies involved in Prairie Gold, recently announced a [19] world-first series of biojet flight tests using fuel derived from Agrisoma's new Brassica carinata variety Resonance™. The Resonance™ oil used for the biojet fuel was grown in Kincaid, Saskatchewan in the summer of 2011 and is being commercially contracted on significant acres in western Canada for the 2012 crop year.

Zymeworks's propriety platforms for designing antibody variants – In 2010, NRC provided crucial validation of the Canadian company Zymeworks's proprietary Azymetric™ platform for designing antibody variants, allowing the company to reach a production milestone on time for pre-clinical trials, secure financing required to move ahead, and in 2011 enter into a [20] significant collaborative deal permitting Merck to use the proprietary platform to develop novel bi-specific antibody therapeutic candidates for use in clinical applications such as oncology or autoimmune disease. This deal could provide Zymeworks with up to US $187M, as well as tiered royalty payments on sales of products. In September 2011, Zymeworks completed a [21] financing round totalling $8.1M to be used to advance its Azymetric™ and AlbuCORE™ platforms, as well as to develop its protein therapeutics pipeline in the areas of cancer, autoimmunity and inflammatory diseases. Because of these developments, Zymeworks is massively expanding the collaborative work performed by NRC: contract values escalated from about $50K per year in 2009 to over $1M presently. NRC will be one of Zymeworks's key partners as development of these platforms and the antibodies they generate continues.

White Gold – Bio-Vision Technology Enterprises Inc. of New Minas, Nova Scotia holds an exclusive license from the NRC to exploit a product it calls Nanocel, a chemically modified version of nanocrystalline cellulose extracted from wood pulp that can be used in everything from making lighter, stronger airplane parts to creating more durable paints and varnishes. Bio-Vision is now [22] working with various researchers and companies to develop different market applications for Nanocel with the goal of becoming the sole industrial supplier of the material.

The Genomics R&D Initiative (GRDI), a multi-departmental funding initiative that currently includes seven federal departments and agencies, was launched in 1999 to build and maintain genomics human resource and infrastructure R&D capacity in Canadian federal science-based departments/agencies and to develop comprehensive networks of research collaboration in the field. An [23] evaluation of GRDI to assess its relevance and performance was completed in November 2011 and found that the initiative met its intended outcomes by enabling federal researchers to participate in and contribute to genomics research in a way that has kept pace with developments in the field, with the level of impact expected to increase in coming years. Furthermore, GRDI has allowed participating federal departments/agencies and Canada as a whole to establish and consolidate their position as valued contributors to genomics research and applications at the national and international level.

More information on Life Sciences Technologies can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

NRC recognized that a better understanding of the complexity of the regulatory landscape was needed in order to better serve its industrial clients. In response, NRC arranged a hands-on workshop for researchers, business staff, and industry technology advisors in Charlottetown, in order to enhance their knowledge regarding regulatory requirements and subsequently be better prepared to work with industry partners on product development and commercialization of functional ingredients and natural products. Several case studies were completed, and various regulatory environments were discussed. In the process, NRC also learned that barriers existed which limited its ability to work effectively and in a timely manner with its clients, thus threatening business relationships with industry. To address this, NRC engaged in extensive direct consultation with partners and clients, resulting in a greater ability to tailor its programs to deliver on industry needs and prosperity for Canada.

Program Activity 1.5: Energy and Environmental Technologies

Program Activity Description: *This program is carried out in partnership with other government departments, universities and industry and brings together the knowledge and expertise needed to make an impact on areas of critical importance to Canada in environmental and sustainable energy. The challenge is to reduce energy consumption while developing clean, sustainable energy alternatives. NRC is working to help alleviate the environmental impacts of activity in the energy, resources, transportation, construction and agri-food industry sectors. NRC performs R&D to develop processes and technologies for environmentally responsible manufacturing.*

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
34.6	47.4	30.0

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
295	342	47

Program Activity Performance Summary

Expected Result	Performance Indicator	Target	Actual Results
Collaborative contributions on improving sustainability of Canada's natural resources and protection of Canada's environment through innovation	Percentage of responding collaborators who respond positively on the value of NRC contributions to natural research sustainability and environmental protection innovations	85% by March 2012	In 2010-11, NRC reported client satisfaction at 88%. These results will be used as a baseline as NRC implements its new client feedback mechanism in 2012-13. In the absence of survey data from clients, NRC's success in attracting "paying clients" speaks positively to the perceived value of NRC innovative contributions. In 2011-12, approximately 60% of clients returned at least once since 2009-10 and 2010-11, and these contributed 80% of the 2011-12 revenues, with the remainder coming from new clients.*

* Data is restricted to paying customers.

Performance Summary and Analysis of Program Activity

The energy industry sector is significant for Canada, as it is the fourth largest contributor to the Canadian GDP at 6.5% (2010) and the largest export product group with [24] $94.8B annually in energy product exports. Canada is ranked consistently as one of the top ten producers of energy in the world. Producing energy in an efficient, environmentally friendly and sustainable manner involves not only abundant resources, but also the best research and technology available. As energy demand forecasts show a growth of 47% by 2035[6], Canada must continue to remain on the cutting edge of innovation in the energy sector to maintain its position as a global energy leader.

NRC's energy and environmental technologies program activity performed very well in 2011-12. Statutory revenues increased by 145.5%, from $4.4M in 2010-11 to $10.8M in 2011-12, driven largely by increases in technical services. The most rapid growth came from industries engaged in development and commercialization of alternative energy solutions, including fuel cell technologies. Revenue increases[7] were seen among all client types, with a marked increase of 68% from industrial clients which have included Automotive Fuel Cell Cooperation Corporation, Oceanic Consulting Corporation and Toyota Motor Corp. This program activity also saw a 9% increase in its reach of clients since 2010-11.

In 2011-12, NRC developed chemicals such as ethanol from lignocellulosic materials, sustainable industrial eco-materials, and biopolyols and biopolymers from renewable resources. NRC also developed transformative pathways to convert waste biomass to high value products such as energy and chemicals, and used the biorefinery approach to convert industrially produced carbon dioxide (CO_2) to renewable algal biomass, which has the potential to provide biofuels, chemicals, and other commercial products. NRC developed new technologies to improve the production of high quality renewable methane as a clean energy source.

Hydrogen for aircraft fuel systems – In an effort to reduce gas emissions, NRC has partnered with Boeing to address the safe utilization of hydrogen in a custom design fuel cell system which could provide reliable auxiliary power as a targeted concept for future commercial aircraft. NRC researchers helped successfully transfer a new fuel cell system to the Aerospace sector, while addressing very rigorous integration and safety requirements. To optimize the system, NRC and Boeing worked together with multiple Canadian suppliers to integrate the fuel cell, hydrogen storage tank, safety devices, and power conditioning equipment in order to overcome various airplane limitations, including run time, temperature, weight, volume and access. While the scale of power generation demonstrated was relatively small, it confirms the feasibility of using fuel cells to help reduce environmental impacts from aviation.

Across the world, algae are being pursued for their capacity to convert CO_2 to energy. In collaboration with the US Department of Energy, NRC established a Collection of Canadian Microalgae, including more than 250 novel algae isolates collected from across Canada, which are being maintained and evaluated for their potential use in commercial scale algal biofuel production as well as their capacity to convert industrially emitted CO_2 and wastewaters into renewable, profitable fuel and non-fuel products.

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[6] International Energy Agency

[7] Estimates based on accrual accounting, with data restricted to paying customers.

NRC provided a one-stop portal to industry for technical support during the development and manufacturing of energy storage technologies by providing consultation services, collaborative R&D, fee-for-service work, technology transfer, and by participating in consortia for technology leadership, mapping and collaboration. NRC developed safety and performance standards of energy storage technologies, while reducing the cost in order to address broader markets. For example, with NRC's assistance, Electrovaya Inc. developed the proprietary Lithium Ion Super-Polymer® battery technology, which uses nanoscience to store more energy in a smaller space. NRC's range of expertise and its established networks of collaborators enabled it to address key technical problems as well as optimize power distribution efficiency through integrated solutions that include sensor systems, smart metering, and decision software.

The sustainability of Canada's water resources is threatened by pressures including changing climate, increased temperatures, changing precipitation patterns, increasing frequency of extreme weather events, and the anticipated increase by 25% in Canada's population by 2050. To address these concerns, NRC is developing green manufacturing processes that require less water than traditional processes, involving technologies such as the use of biocatalysts, green chemicals, and low temperature microbial systems. In particular, NRC scientists have developed a method of producing high quality natural biofibres which can be used to make biocomposite materials to replace other commercial products like fibreglass. Using enzymes, the processes to produce fibres and other value added consumption have lower overall water usage and energy consumption, resulting in lower net CO_2 emissions.

International Award for Environmental Monitoring and Assessment – NRC's Applied Ecotoxicology and Analytical Chemistry groups were co-recipients of the [25] 2011 TTCP Scientific Achievement Award in collaboration with other scientists and engineers from Canada, US, UK, and Australia. This multi-disciplinary research led to significant contributions to advance knowledge and understanding of the environmental fate and impact of environmental contaminants, and to improve the ecological risk assessment and monitoring of testing and training ranges at defense installations in The Technical Cooperation Program (TTCP) nations. Scientifically-based environmental tolerance values and bioaccumulation data, as well as transformation pathways were developed. These tools will be used by site managers as decision-making tools to assess the exposure risks at sites, and to ensure the management of facilities as sustainable resources.

In support of Canada's mining industry, NRC worked with the Mining and Wear Consortium (which includes Syncrude, Suncor and 23 other companies) addressing equipment wear problems that cost the industry more than $2.5B per year in maintenance costs. Conservation of resources (time, energy, and money) is also the objective of Vale Inco's use of NRC's Laser-induced Breakdown Spectroscopy (LIBS) technology, which allows the company to efficiently remove sulfur and iron from their nickel fabrication process.

More information on Energy and Environmental Technologies can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

NRC recognized that it could further improve integration between multidisciplinary fields and within different divisions by developing common skills and methodologies. As part of its program management model, NRC will be incorporating a fully integrative R&D approach through a common program/project management process, and in 2011-12, NRC adopted the Project Management Institute (PMI) global standard, and provided training for its NRC program managers.

Strategic Outcome 2

Canadians have access to research and development information and infrastructure

Through NRC, Canadian firms and researchers accessed national facilities and information infrastructure to help them conduct fundamental research and take new products and technology innovations to market. This infrastructure includes the TRIUMF sub-atomic research facility, a suite of neutron-scattering spectrometers at Chalk River Laboratories, and, as mandated by the [1] *National Research Council Act*, a national science library and astronomical observatories in which Canada has an interest. NRC also serves as Canada's national metrology institute, providing a system of measurement standards that underlie domestic and international trade.

NRC's national science library collection was heavily used by Canadians. Almost 28,000 documents were supplied from the collection of scientific, technical and medical (STM) information, with an additional 40,000 being supplied to the rest of the world. The volume of requests made against the collection indicates the value that clients found with this service.

Program Activity 2.1: National Science and Technology Infrastructure

Program Activity Description: *This program manages national science and engineering facilities for Canadian scientific and technological communities. Facilities include astronomical observatories, the laboratory for national measurement standards, the TRIUMF sub-atomic research facility, and a suite of neutron-scattering spectrometers at Chalk River Laboratories.*

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
92.0	100.1	96.4

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
284	282	(2)

Program Activity Performance Summary

Expected Results	Performance Indicators	Targets	Actual Results
Canada's national science and technology facilities are up-to-date	Percentage of surveyed clients reporting positively	85% by March 2012	In 2010-11, NRC reported client satisfaction at 93%. These results will be used as a baseline as NRC implements its new client feedback

Expected Results	Performance Indicators	Targets	Actual Results
and accessible to Canadians in accordance with federally legislated and assigned mandate and/or evolving national needs	on their perceived value of NRC R&D infrastructure used		mechanism in 2012-13. In the absence of survey data from clients, NRC's success in attracting users of its infrastructure speaks positively to the perceived value of NRC contributions.
	Number of Canadian users of major NRC science infrastructure	1,200 by March 2012*	NRC's science infrastructure user communities have remained stable over the last three years, and in the period since 2009, NRC welcomed 1,947 users, surpassing its target of total users.

* Total cumulative users since April 2009

Performance Summary and Analysis of Program Activity

The findings of the [26] Evaluation of the International Telescope Agreements Program, conducted in 2011-12 and involving 33 stakeholder interviews, indicated that the Program is administered in an efficient manner and is well connected to its user community. Users of the facilities were found to be satisfied with the manner in which NRC has administered access to the telescopes. Key external factors contributing to the cost-effectiveness of the program included a sense of commitment to planning as well as strong relationships among the stakeholders. Overall, the findings of the evaluation of the International Telescope Agreements Program show that the program represents good value-for-money for NRC and for Canada. In addition, NRC's data management skills were deemed to be "one of a kind" by external key informant interviewees and necessary for the effective operation of the Canadian Astronomy Data Centre, an essential component of the International Telescope Agreements Program. The Evaluation found overall that the Program continued to address the needs of Canadian astronomers and is well-aligned with NRC's and Canadian S&T strategies. It also showed that the high subscription rate for Canada's international telescopes demonstrates a healthy demand for telescope access by Canadian astronomers. This demand is viewed by the astronomy community as a reliable indicator of the relevance of the observatories and their instrumentation.A separate study completed in 2011, *Astronomy in Canada,* found that expenses incurred by the Canadian government on observatories are approximately equal to the quantifiable economic impacts for the country, which are in addition to the notable unquantifiable social benefits.

NRC delivers final receivers to ALMA – Ten years after agreeing to design and develop 73 state-of-the-art receivers operating at 3mm (100 GHz), as part of Canada's contribution to the $1.4B international Atacama Large Millimetre/submillimetre Array (ALMA) radio telescope, NRC shipped the final receiver to ALMA in February 2012 – on budget and about three months ahead of schedule. ALMA, a partnership of Europe, North America and East Asia in cooperation with Chile, is a unique array of 66 radio dishes located in Chile at the highest and driest desert in the world. The observatory is expected to revolutionize the study of planet, star, and galaxy formation and now, through an extremely competitive observing proposal process, Canadian researchers have unlimited access to North America's approximately one-third share of all ALMA observing time. Canadian companies made significant contributions to this challenging multimillion-dollar telescope: Nanowave Technologies (Etobicoke, ON) for the construction of detector assemblies and cryogenic low-noise amplifiers; Daniels Electronics (Victoria, BC) for materials management and mechanical integrations; and K-Tec Industry and Prototype Equipment Design (BC) for high-precision micro-machined parts. Nanowave will be adapting the technology licensed from NRC to new markets for commercial and defence radar and satellite communications.

Access to international telescopes has afforded Canadian astronomers the opportunity to generate new knowledge while contributing to the training of highly qualified personnel. Publications resulting from the use of the international telescopes suggest that not only are Canadian astronomers generating new knowledge, they are also effectively disseminating it to the broader international astronomical community. In addition to the scientific benefits accrued to Canada as a result of its participation in the International Telescope Agreements, the Program has enabled Canadian private-sector firms to contribute to the development of telescope instrumentation and ultimately enhance their own technological capabilities.

Metrology underpins industrial competitiveness, trade, and commerce and is central to defining and enforcing the regulatory framework designed to protect our citizens. NRC leverages existing metrology expertise in combination with new measurement competencies required for emerging technologies. This approach positions NRC to deliver economic and societal impacts for Canada by: developing measurement solutions for emerging challenges faced by government and industry; addressing evolving metrology needs in mature industrial sectors and regulatory areas; and supporting public- and private-sector stakeholders in the national measurement system. The increasing globalization of trade has made metrology and the establishment of national measurement standards essential for assuring global market access to Canadian industry by reducing non-tariff trade barriers.

In 2011-12, NRC supported Canada's national and global trade interests by strengthening participation in international metrology activities. NRC's revenues[8] relative to its metrology services grew by 7% despite the economic downturn, indicating that both calibration services and collaborations with NRC are in high demand.

One area of focus is electrical measurement which has significant impacts on energy savings and the smart grid. Deregulation in the electrical power generation and distribution industry and the ensuing increase in competition has resulted in a more complex distribution grid and a greater number of business-to-business transactions. Facilitating trade in this new complex environment requires reliable, accurate and traceable measurements. Every electrical measurement in the Canadian market is traceable to NRC, and the value of all transactions

Measuring the quantum wavefunction – Scientists around the world now have a new tool to investigate the elementary units of nature. Until now, the quantum wavefunction was believed to be impossible to measure directly, since the very act of observing it would alter it. However, a research team from the NRC created a new tool to investigate this state, showing for the first time how it can be directly observed and defined. The results have been published in *Nature*. The team discovered that by measuring the position of the particle using what is known as "weak measurement," one can avoid the change normally inflicted on the particle. By performing the measurement repeatedly, one can eventually find the average result.The wavefunction is at the very heart of quantum mechanics. Every object in the universe has a quantum wavefunction that determines and predicts how it will react to other objects. It is used for everything from quantum cryptography, computing and metrology, to drug design and microelectronics. By knowing the measurement of the wavefunction, it is possible to calculate where a particle is most likely to be, or how fast it is likely to be moving. The development of this direct measuring method could allow scientists to design better drugs and chemicals and build faster computer processors, putting Canada in a leadership position to create next generation technologies.

[8] Estimate based on accrual accounting, with data restricted to paying customers.

in Canada is $57B per year. The impact of a 0.5% error in measurement applied to the overall value of all transactions in electricity would translate into $285M (possible savings or loss) per year. NRC is currently working with a local utility to enable on-site measurement of power cables.

The NRC Canadian Neutron Beam Centre (NRC-CNBC) provides neutron beams to researchers seeking to obtain new understandings of materials, improve products and strengthen their businesses. NRC-CNBC enables research in sectors such as nuclear energy, aerospace, automotive, oil and gas, defence and primary metal production. In 2011-12, there were 244 research participants including 99 individuals from over 36 departments in 23 Canadian universities from seven provinces (Alberta, British Columbia, Manitoba, Nova Scotia, Ontario, Quebec and Saskatchewan) and 111 individuals from 51 foreign institutions in 15 countries. This compares to an average of 250 research participants each year from 2006 to 2008, the most recent full years of operation of the reactor.

TRIUMF functions as Canada's national laboratory for research in subatomic physics and as Canada's gateway to international subatomic physics. It is operated as a joint venture by a consortium of 11 Canadian full-member universities and six associate-member universities. TRIUMF houses particle accelerators that produce energetic beams of subatomic particles for fundamental research in nuclear and particle physics and in nuclear medicine. TRIUMF's successes in 2011-12 include significant progress in the construction of the next-generation isotope-production facility Advanced Rare IsotopE Laboratory (ARIEL). Although construction of the target hall has not yet begun, excavation of the area and the design, installation and commissioning of the first element of the electron linear accelerator (the electron gun) is complete. TRIUMF scientists also led a global effort at the international ALPHA collaboration at CERN, the European Organisation for Nuclear Research, to produce, trap, and maintain a collection of antihydrogen atoms for more than 1,000 seconds – the world record. The team then began the first-ever studies to characterize in detail the "chemistry" of these anti-atoms.

With support from the Natural Sciences and Engineering Research Council (NSERC), the Canadian Institutes of Health Research (CIHR), and Natural Resources Canada, a TRIUMF-led team announced in February 2012 that they had successfully produced commercial quantities of the key medical isotope technetium-99m on existing cyclotrons in both Ontario and British Columbia. The team is now finishing installation of the automated systems for irradiation and processing as well in discussions with potential private-sector partners. The impacts are significant as approximately 85% of diagnostic imaging procedures in nuclear medicine use this isotope.

More information on National Science and Technology Infrastructure can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

Ensuring Canadian researchers have access to leading-edge science infrastructure is essential for Canada to remain a research and innovation leader, to train future generations

of scientists and entrepreneurs and to attract/retain highly qualified personnel able to compete with the best in the world. Large scale research facilities are increasingly international partnerships. The scale and cost of new generation facilities exceed the capacity of individual nations, requiring the need to create new international collaborative models and relationships. In order to continue to be able to support the evolving needs of Canada's astronomical community, in 2011 NRC completed a revision and obtained approval of the Terms and Conditions for its International Telescope Agreements program, allowing flexibility in the type of financial support provided to emerging international telescopes collaborations.

Program Activity 2.2: Scientific, Technical and Medical Information

Program Activity Description: *This program operates and maintains the national science library, specifically holding the national collection of Scientific, Technical and Medical (STM) information. The program provides Canada's research and innovation communities with access to global STM information, to facilitate knowledge discovery, cross discipline research, innovation and commercialization.*

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
13.2	18.9	18.1

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
90	96	6

Program Activity Performance Summary

Expected Result	Performance Indicator	Target	Actual Result
High value information that advances research and innovation in the areas of science, technology and health/medicine	Percentage of clients who reported that NRC Canada Institute for Scientific and Technical Information (NRC-CISTI) information services contributed to advancing their research and development, technology commercialization or planning and decision-making	85% by March 2014	100% of its Strategic Technical Information Analysis users who gave feedback* indicated they were either Very Satisfied or Satisfied with services received.

* Respondents included five Defence Research and Development Canada (DRDC) and eight (internal) NRC clients, who provided feedback on a total of 14 DRDC and 4 NRC requests.

Performance Summary and Analysis of Program Activity

NRC made high quality information available to Canadians to support their R&D efforts and the resulting deployment of solutions to industry through the NRC STM Information program. Services such as Strategic Technical Information Analysis (STIA) translate large amounts of information from various sources into concise intelligence on which to base decisions. Skilled information specialists ensure that the best information is used as input into reports to increase the likelihood of effective decision making. The information discovery and document delivery services provided access to the national science library collection and other published literature that allowed researchers and decision-makers to

get information quickly and efficiently. Repositories like the NRC Publications Archive (NPArC) and PubMed Central Canada made research outputs from NRC and the Canadian medical research community easily available to support further research and innovation. STIA clients who gave feedback commented that the information was critical to providing an understanding of the current technology and market, and the competitive position. "The [analysis] greatly helped us make the right decision on the direction we should go and make recommendations to our industrial partner. We really appreciate the efforts and contributions from CISTI services." Demand for this service is consistently greater than NRC's capacity to deliver it, indicating both the need for such a service and the clients' recognition of NRC's expertise in this area.

To fulfill its role in delivering information services to the Canadian Innovation community, NRC supplied almost 28,000 documents to Canadians from the national science library collection, with an additional 40,000 being supplied to researchers around the globe on a fee basis. An additional 4,000 electronic STM journals were made accessible via the document delivery service to not-for-profit organizations, universities, colleges, government departments and health organizations in Canada through NRC's licensing agreements and in partnership with Infotrieve Canada.

NRC's library services such as licensing for content were used by eight federal departments or agencies, allowing their staff to provide better services to their clients. In-depth information analyses were provided to the developing NRC programs and externally to another government department. These analyses helped the recipients understand the opportunities and risks associated with certain technologies or research directions that in turn improved the decision-making around research directions. NRC also implemented three additional shared library service agreements with other science based departments and agencies for a total of eight agreements. Interest was shown by another four departments, indicating a level of recognition within the federal library community of the advantages that shared library services can offer as an alternative mechanism for providing quality library services.

CISTI Mobile – In June 2011 [27] NRC launched the first federal library mobile website, and one of the first federal mobile websites ([28] NRC-CISTI Mobile), which allows anyone with a smart phone or other mobile device to get information from NRC's STM collection no matter where they are. The application is compatible with most up-to-date mobile devices and can be launched by scanning a Quick Response (QR) code from the Web and on posters and signage. This initiative demonstrated how existing technology can be quickly and effectively leveraged to provide new channels of service delivery.

NRC contributed to the nation-wide initiative to make research data more easily accessible by implementing a DataCite digital object identifiers (DOI) registration service and by organizing a Research Data Summit. [29] DataCite Canada now allows organizations to register research data sets and assign DOIs to them, enabling the linking of data sets to other research outputs such as publications. The initiatives that NRC took to make research data more accessible increase the return on investment, particularly for irreproducible data sets (e.g. from the International Polar Year research), and provide researchers with additional resources on which to base new discoveries.

Research Data Summit – In September 2011 the first [30] Canadian Research Data Summit, organized by NRC, was held in Ottawa. Over 150 leading players and decision-makers from government, private sector, academia and NGOs worked on formulating a shared strategy for addressing the challenges and opportunities for maximizing the benefits of our collective investment in research data in Canada. [31] *Mapping the Data Landscape: Report of the 2011 Canadian Research Data Summit* outlines the findings and recommends further steps in increasing the accessibility of research data for additional uses.

A major infrastructure upgrade to [32] PubMed Central Canada (PMCC) was completed which allowed the Canadian Web site to be modified to have a unique, homogeneous feel throughout, and to provide increased flexibility in modifying it in the future. PMCC continued to be heavily used by the Canadian health community and over 300 grants now have articles associated with them, allowing Canadians to see the impact of grants by linking to the research outputs.

More information on Scientific, Technical and Medical Information can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

Implementing shared library services presented some challenges to NRC this year. Issues of sustainability and internal capacity surfaced, indicating that a good understanding of the resources required to operate a shared library service over the long term is a key element to a successful partnership. NRC responded to this challenge by completing a detailed review and costing exercise so that a realistic costing model could be used in future discussions with current and potential partners. Concerning the NRC Publications Archive, NRC postponed planned enhancements in favour of investigating the potential of an alternate infrastructure that would allow more types of content to be included in the archive. A proof-of-concept project was launched and recommendations are expected in 2012-13.

Internal Services

Description: *Internal Services are groups of related activities and resources that are administered to support the needs of programs and other corporate obligations of an organization. These groups are: Management and Oversight Services; Communications Services; Legal Services; Human Resources Management Services; Financial Management Services; Information Management Services; Information Technology Services; Real Property Services; Materiel Services; Acquisition Services; and Travel and Other Administrative Services. Internal Services include only those activities and resources that apply across an organization and not to those provided specifically to a program.*

2011-12 Financial Resources ($ millions)

Planned Spending	Total Authorities	Actual Spending
123.0	134.3	123.9

2011-12 Human Resources (FTEs)

Planned	Actual	Difference
625	660	35

Performance Summary and Analysis of Program Activity

Governance and Management Support

Integrated Business and Client Services: In 2011-12, NRC initiated the development of a new strategy around key account management and client relationship management with the aim of standardizing its business practices and becoming more industry focused. Furthermore, NRC developed high level requirements for its Client Relationship Management (CRM) System that were later used in the request for proposal (RFP) process. Validation of the proof of concept for its new CRM processes and system was completed for an official launch in 2012-13. In striving to improve its business acumen, NRC held monthly online business training and orientation seminars and continued to foster a culture of collaboration through regular exchanges of business information among its business practitioner community with meetings held every other week. During 2011-12, NRC provided strategic IP management advice in an effort to ascertain the commercial viability of its technologies which assured best value for money. Finally, with the objective of improving responsiveness to clients, NRC took steps to align its contracting-in processes to industry best practices in addition to developing a generic consortium model for its programs to assist in negotiation and drafting of complex consortium agreements.

Integrated Communications, Marketing and Branding: NRC launched its first-ever business-to-business advertising campaign targeting industry clients, which ran nationally in print, online and in five major Canadian airports. The new business brand was reinforced in a variety of materials throughout the organization, including event banners, business materials, and on the corporate website. NRC also made great strides in expanding its media presence featuring topical and innovative stories that resonate with key audiences. The Speakers Bureau initiative was launched to showcase the impact of NRC research on Canadian industry and innovation, and was targeted at Members of Parliament, media and the public. These activities increased the Council's profile and presence through a wide array of outlets (radio, Twitter, YouTube, Facebook, and blogs).

International Relations: In 2011-12, NRC used its strong international reputation to develop relationships with key organizations abroad both to enhance effective operations of its own business lines and to play a leadership role within Canada. In countries where Canada has S&T agreements and similar treaties, NRC developed linkages with innovation actors ranging from establishing vaccines workshops with the China National Biotec Group, to identify areas of collaboration in 3rd generation biofuels with the French Commissariat à l'énergie atomique. NRC also participated in the Joint Bilateral Committees that govern Canada's S&T Agreements – including senior level involvement with countries such as China and Germany – which helps advance

CANNAPE – 2011 marked the first year of the Canadian Networking Aeronautics Program for Europe (CANNAPE), a two-year proposal co-funded with the EU. By building partnerships at the national and international levels (including Industry Canada, Department of Foreign Affairs and International Trade, the Natural Sciences and Engineering Research Council (NSERC) and the Aerospace Industry Association of Canada), NRC helped secure a strategic Canadian aerospace position on the EU's FP7/Horizon 2020 program. In 2011-12, Canadian participation increased in EU-accepted proposals (from zero to 10) in strategic areas, involving Canadian firms, NRC and universities. Anticipated long-term impacts include opening doors to the EU's 3B Euro investment, increased aerospace jobs in Canada, enhanced Canadian competitiveness and Canadian company access to global supply chains via Europe for increased market access and revenues.

international collaborative projects important for Canadian industrial competitiveness and issues of national importance.

In addition to working alongside NRC-IRAP to secure Canada's position within EUREKA, NRC co-chaired the 2011 Canada-Israel Innovation Summit with Israel's Office of the Chief Scientist, Ministry of Industry, Trade and Labor. These Summits emphasize linkages between companies and researchers that advance collaborative projects with tangible economic benefits in water, renewable energy and brain research. The establishment of these important international linkages with innovaction actors, supported by Canada's Minister of Industry, leveraged NRC's international credibility and helped Canadian companies access global value chains.

Integrated Planning and Performance Management: NRC began implementation of a corporate-level performance management framework (PMF) to drive organizational alignment in achieving corporate-level goals and strategic outcomes for NRC, as well as to manage the organization for efficient and effective operations. In 2011-12, key performance indicators were identified for targeted outcomes, and performance objectives cascaded from the corporate level to research and operational levels, and each individual via the Commitment To Excellence (CTE) program. Alignment of the indicators at all levels will enable NRC to roll up achievements to demonstrate progress in meeting strategic goals and outcomes in relation to resources. Quarterly performance reviews were defined for implementation in 2012-13, to parallel ongoing development and implementation of common business processes and information systems, including a client relationship management system and common platform and practice for the management of projects. These quarterly performance reports will enable managers to monitor variance to plans and make effective decisions.

Program and Project Management: In 2011-12, NRC launched a rigorous stage-gate process (the "Program Lifecycle") to ensure that programs are focused on a sound understanding of industry value chains, with clear technology deployment paths identified, and support federal S&T priorities to achieve clearly identified outcomes. Close to 60 programs were brought to various phases of re-orientation, from concept and proposition stage to implementation planning. Workshops were held to address the development of business cases, business plans and implementation plans, and training provided in the SAP Project System (SAP-PS) for modules of project management and project accounting. A cross-NRC network was established to identify and train key representatives from each research unity to transition program and project activities into SAP-PS in 2012-13.

Resource Management Services

Integrated Human Resource Management: In 2011-12, the Human Resources Branch (HRB) implemented its organizational design following the comprehensive review in 2010-11 to ensure that the branch is positioned to effectively support the strategic direction of NRC and deal with emerging HR challenges. A component of the design includes centralized hiring activities through a shared services hiring model that was implemented in November 2011. Its implementation allowed for progress in streamlining staffing processes and increased capacity to serve clients in a timely and cost-effective manner. In addition, over time, the model will allow for ongoing development of specialized hiring capability

specific to occupational categories and for the building of organizational capability by supporting managers' development of hiring expertise.

2011-12 saw the implementation of NRC's new program for planning, enabling and recognizing performance: Commitment To Excellence. Over 800 NRC managers and supervisors were provided with information and training aligned to the organization's values of "leadership," "accountability" and "impact" to support the implementation of the new program. Training focused on increasing the understanding of managers and supervisors on motivation and performance, and as well as building skills that enable managers to create the conditions for employees to succeed.

Occupational Safety and Health: Recognizing that the existing NRC Occupational Safety and Health (OSH) structure and resources would not effectively align with the NRC program-based management model, in 2011-12, the OSH Merger Working Group was tasked with proposing a new OSH organizational structure and transition plan which would allow NRC to be a reasonable leader in OSH and meet its legal responsibilities while serving all NRC clients. A new reporting structure and realignment of services was proposed and approved, in addition to a transition plan that aims to use available resources effectively while integrating new personnel to address critical areas immediately, while leaving room for organization expansion as resources allow. Implementation of the new structure is set for 2012-13. In 2011-12, the NRC National OSH Team also began auditing the Occupational Safety and Health for workplaces under the control of NRC. Through the audit, objective evidence is collected to confirm conformance to the audit criteria. Reference is made against the Canada Labour Code, Part II and associated regulations, as well as the NRC OSH Directives. The objective of this exercise is to identify and provide assistance to those institutes/organizations that fall below the level of compliance.

Financial Management: Financial management processes, reporting and systems were assessed and a path forward identified to support NRC's re-focusing efforts. An accrual-based financial statement approach and reporting model was defined to support a sustainable planning cycle and the continued development of its business intelligence reporting tool, to support planning, operations, decision-making, accountability, transparency and the production of new financial reporting requirements.To support a rigorous performance and sustainable planning cycle, NRC enhanced its Business Intelligence (BI) financial reports and expanded its real-time financial dashboard to support a monthly budget review process and production of the new financial reporting requirements of Quarterly Financial Report and Future-Oriented Financial Statements.

Investment Planning: NRC implemented the first year of its five-year Investment Plan. The new governance structure and associated integrated investment planning process to assess risk and prioritize investment requirements was put into practice as detailed in the plan that was approved by Treasury Board on March 24, 2011. NRC's focus for the first couple of years of the Investment Plan is to invest in existing assets that support core research and development activities, in particular, rust-out issues related to real property, scientific equipment, laboratories and information technology assets. Thirty-one investment projects were initiated during the year with actual expenditures of $15.2M Capital and $2.1M other funding (operating and salary budgets).

Information Technology Services: Performance in this area was largely influenced by NRC's program changes and other consolidation activities that are ongoing with SSC. Concurrent with the SSC transfer, and to allow NRC to focus its IT service delivery at the enterprise level, thereby reducing complexity and maximizing efficiencies in its IT environment, NRC consolidated its distributed computing services under its Information Management Services Branch (NRC-IMSB). NRC-IMSB worked in close collaboration with its common services partners to completely reconfigure NRC's enterprise resource management system (based on SAP) in support of NRC's financial and program management models. The timely completion of this work was critical to NRC's successful transformation. To support greater collaboration among the new research units, NRC expanded its SharePoint services, negotiated a corporate licencing management agreement with Microsoft for its Office productivity software suite, and worked closely with SSC to standardize access controls on the network. These initiatives facilitate document sharing and workflow among the new research units and dramatically reduce the current complexity in NRC's IT environment.

Security Services: During the reporting period, performance focused on maintaining NRC's security services operations while undergoing significant reorganization and planning activities. From the high level risk assessment and gap analysis conducted as part of the departmental security planning, 15 projects were identified to improve NRC's security posture. Nine projects were initiated and two were completed: one to educate and train staff regarding specific actions to take in effectively dealing with workplace violence, and another to formally involve security experts at the initiation stage of IT and real property projects. The successful completion of these two projects reduced the risks faced by NRC by improving staff safety and ensuring that appropriate security guidance was included in the lifecycle of NRC projects.

Asset Management Services

Real Property: NRC expanded its capacity to monitor and manage its real property portfolio through continued investment in property management software, which was deployed throughout its facilities across Canada. This enabled NRC to manage, monitor and report on the entire real property portfolio in an accurate, consistent and timely manner. In addition, the Condition Assessment module of Archibus/FM (Facilities Management) was deployed to accurately track building condition assessments, deferred maintenance costs and recapitalization costs throughout NRC's real property portfolio.

Acquisition and Materiel Management: NRC's Contract Review Committee (CRC) met weekly to review contracts, ensuring that they met the criteria of its Terms of Reference. The CRC noted that the dollar thresholds in these Terms of Reference need review and possible revision to accommodate NRC's organizational transformation. The Materiel Management manual will be updated in 2013-14 to reflect and accommodate NRC's organization changes.

More information on Internal Services can be found on [15] the supplementary information page for NRC's DPR 2011-12.

Lessons Learned

Strong financial management processes and reporting is a key element in supporting NRC's re-focusing into a unified and industry-driven organization. During 2011-12, it was evident that existing processes were inadequate to support NRC's changes, so financial management processes, reporting and systems were assessed and a path forward was identified, one which includes the implementation of standard financial processes and reporting. This will support a sustainable planning cycle and ongoing strengthening of its financial management and control practices. From a financial management perspective, this will also position NRC to become more efficient and effective.

IT service delivery at NRC has always been optimized at the research unit level. However although very responsive to institute needs, this model proved to be expensive, duplicative, technologically complex, and it hindered effective and efficient collaboration and document sharing among staff. As part of its common services changes, NRC will simplify its IT environment by taking an enterprise approach to IT service delivery, standardizing wherever possible and eliminating duplicate services.

While gathering information from all NRC sites to support the consolidation of security services under a single group, it became apparent that security was being managed differently from one site to another, and at varying levels of quality and risk. To ensure that NRC takes a comprehensive and consistent approach to security management across NRC and that baseline requirements are met, a project was launched to survey and assess the security posture of all NRC facilities. Subsequent projects will be launched to implement the recommendations stemming from the assessment.

With regard to HR issues, several lessons learned were realized through the 2011-12 implementation of the HRB organizational design. Implementation of the centralized hiring model revealed that staffing had been conducted very differently in the organization's research units. As a result, greater effort was required than was anticipated in order to streamline processes in support of the model. The decentralization of HR's Executive Services function resulted in lost corporate knowledge with respect to the executive and management groups. An HRB resource has since been put in place to help bridge this gap. Finally, the OSH restructuring exercise brought to light the benefits of involving a community in shaping its future to help ensure a more effective organization.

After choosing to participate in the [33] 2011 Public Service Employee Survey (PSES), NRC achieved a response rate of 72.6%. Participation in the survey during a period of change may have led to less than favourable results experienced in several areas. However, the results of the survey did indicate increases in employee/supervisor relations which can be correlated to the launch of the new employee performance management program: Commitment To Excellence. The results will be further evaluated in the upcoming fiscal year to formulate an action plan to address those areas which received less than favourable survey results.

Changes to Government Structure

Impacts on Financial and Human Resources Resulting from the Establishment of Shared Services Canada

2011-12 Financial Resources ($ millions)

	Planned Spending	Total Authorities*
Net transfer post Orders in Council (OIC)** to Shared Services Canada (SSC)	690.8	8.9

* Pursuant to section 31.1 of the *Financial Administration Act* and Orders in Council P.C. 2011-0881, P.C. 2011-0877 and P.C. 2011-1297, this amount was deemed to have been appropriated to SSC, which resulted in a reduction in the appropriation for NRC.

** Total authorities, as presented in the "2011-12 Financial Resources" table (and other relevant tables) in the "Summary of Performance" section, is the net of any transfers to SSC. Actual spending does not include expenditures incurred on behalf of SSC as of the OIC date.

2011-12 Human Resources (FTEs)

	Planned	Actual
Deemed to SSC	3,743	76

Section III: Supplementary Information

Financial Highlights

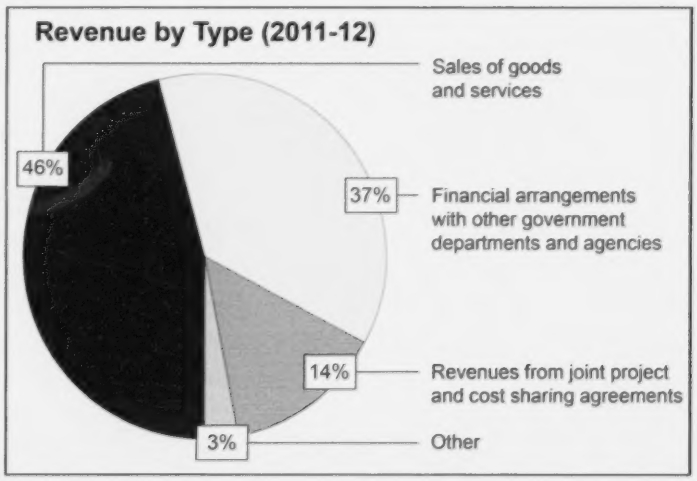
This general overview of NRC's financial position and operations is presented on an accrual basis for comparability with the complete financial statements published on [15] NRC's Web site.

Condensed Consolidated Statement of Financial Position ($ thousands) as at March 31, 2012	% Change	2011-12	2010-11
Total Net Liabilities	-14.16%	267,096	311,142
Total Net Financial Assets	-4.07%	216,326	225,510
Departmental Net Debt	-40.71%	50,770	85,632
Total Non-Financial Assets	-4.07%	575,975	600,395
DEPARTMENTAL NET FINANCIAL POSITION	2.03%	525,205	514,763

Condensed Consolidated Statement of Operations and Departmental Net Financial Position ($ thousands) for the year ended March 31, 2012	% Change	2011-12	2010-11
Total Expenses from Continuing Operations	-15.24%	847,643	1,000,056
Total Revenues from Continuing Operations	1.67%	170,913	168,105
Net Cost of Continuing Operations	-18.66%	676,730	831,951
Net Cost of Discontinued Operations	-100.0%	0	723
NET COST OF OPERATIONS before government Funding and Transfers	-18.73%	676,730	832,674
DEPARTMENTAL NET FINANCIAL POSITION	2.03%	525,205	514,763

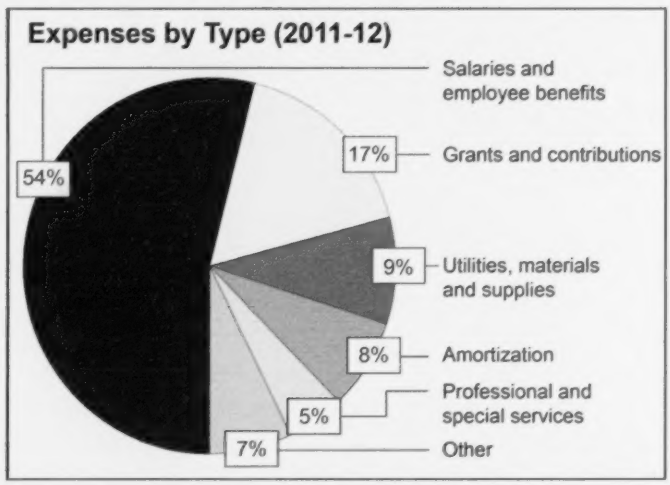
Financial Highlights – Charts and Graphs

NRC activities generate revenue which can be reinvested in operations. NRC earned total revenues of $170.9M in 2011-12, up from $168.1M in 2010-11. NRC's largest component of revenue results from the sale of goods and services at $78.6M, primarily consisting of research services provided to industry and academic clients ($59.9M), with the remaining balance provided by NRC rights and



privileges ($8.6M), the sale of goods and information products ($5.2M), and lease and use of property ($4.9M), all calculated on an accrual basis. As part of its organizational strategy, NRC is looking to further increase external revenue in future years.

NRC incurred total expenses of $847.6M in 2011-12, down from $1,000.1M in 2010-11. NRC's major expense components are salaries and employee benefits ($455.5M) and grants and contributions ($143.6M), representing 70.7% of total expenses. The $152.5M decrease is primarily due to reduced parliamentary appropriations for grants and contributions due to the sunsetting of Canada Economic Action Plan funding.



Financial Statements

NRC's complete financial statements are published on [15] the supplementary information page for NRC's DPR 2011-12.

List of Supplementary Information Tables

Electronic supplementary information tables listed in the 2011-12 Departmental Performance Report can be found on the [15] National Research Council's web site:

- Details on Transfer Payment Programs (TPP)
- Green Procurement
- Horizontal Initiatives
- Internal Audits and Evaluations
- Response to Parliamentary Committees and External Audits
- Sources of Respendable and Non-Respendable Revenue
- User Fees Reporting

Section IV: Other Items of Interest

Organizational Contact Information

Questions and requests for information may be directed to:

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1200 Montreal Road, Bldg. M-58
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Fax: (613) 952-9907
TTY number: (613) 949-3042
E-mail: info@nrc-cnrc.gc.ca

Additional Information

NRC Council

NRC's Council provides strategic direction and advice to the President and monitors progress against strategic plans. The Minister of Industry may also consult the NRC Council for advice on matters that affect NRC and that are of importance to science and technology in Canada. The Council usually meets three times a year and has two standing committees: the Executive Committee and the Human Resources Committee. The Council is chaired by the President of NRC and the other members are appointed by the Government of Canada for three-year terms. Current members are as follows. An updated list is maintained on [34] NRC's web site along with biographies of the members.

John R. McDougall – President (and Chair of Council), National Research Council, Ottawa, Ontario
Jacques Beauvais – Sherbrooke, Québec
Paul Clark – Calgary, Alberta
Peter Frise – Windsor, Ontario
Alexandre Jodoin – Manotick, Ontario
Jay Josefo – Toronto, Ontario
Raymond Leduc – Bromont, Québec
Margaret Lefebvre – Montréal, Québec
Cecil H. Rorabeck – London, Ontario
Leo Steven – Cardigan, Prince Edward Island
Robert Warren – Winnipeg, Manitoba
David Wood – Vancouver, British Columbia

Endnotes

[1] Department of Justice, http://laws-lois.justice.gc.ca/eng/acts/N-15/index.html
[2] Industry Canada, http://www.ic.gc.ca/eic/site/icgc.nsf/eng/00871.html
[3] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx
[4] State of the Nation 2010: Canada's Science, Technology & Innovation System, http://www.stic-csti.ca/eic/site/stic-csti.nsf/eng/h_00038.html
[5] Innovation Canada: A Call to Action, http://rd-review.ca/eic/site/033.nsf/eng/h_00287.html
[6] National Research Council, http://www.nrc-cnrc.gc.ca/eng/irap/dtapp/index.html
[7] Genomics R&D Initiative, http://grdi-irdg.collaboration.gc.ca/eng/aboutrnd.html
[8] National Research Council, http://www.nrc-cnrc.gc.ca/eng/irap/about/chtd.html
[9] Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals, http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[10] Canada's Economic Action Plan, http://www.actionplan.gc.ca/en
[11] Public Works and Government Services Canada, http://www.tpsgc-pwgsc.gc.ca/recgen/txt/72-eng.html
[12] National Research Council, http://www.nrc-cnrc.gc.ca/eng/achievements/highlights/2011/glacier_engines.html
[13] National Research Council, http://www.nrc-cnrc.gc.ca/eng/irap/success/2011/profile_composites_lightweight_products.html
[14] National Research Council, http://www.nationalcodes.nrc.gc.ca/eng/necb/index.shtml
[15] National Research Council, http://www.nrc-cnrc.gc.ca/eng/reports/2011_2012/dpr/dpr_supplementary.html
[16] Review of Federal Support to Research and Development, Final Report, http://rd-review.ca/eic/site/033.nsf/eng/h_00287.html
[17] EUREKA, http://www.eurekanetwork.org/
[18] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/arp/acpe11-eng.asp
[19] Canada.com, http://www.canada.com/Sask+fields+grow+biofuel/6587617/story.html
[20] Genetic Engineering & Biotechnology News, http://www.genengnews.com/gen-news-highlights/merck-co-seals-bispecific-antibody-collaboration-with-zymeworks/81245600/
[21] Zymeworks, http://www.zymeworks.com/news/2011-09-22.html
[22] The Chronicle Herald, http://thechronicleherald.ca/business/49469-firm-has-big-dreams-nanocrystals
[23] National Research Council, http://www.nrc-cnrc.gc.ca/eng/about/planning_reporting/evaluation/2011_2012/grdi.html
[24] Foreign Affairs and International Trade Canada, http://www.international.gc.ca/economist-economiste/performance/state-point/state_2011_point/2011_5.aspx?lang=eng&view=d
[25] Canada News Centre, http://news.gc.ca/web/article-eng.do?nid=630829
[26] National Research Council, http://www.nrc-cnrc.gc.ca/eng/about/planning_reporting/evaluation/2011_2012/international_telescope_agreements.html
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[32] PubMed Central Canada, http://pubmedcentralcanada.ca/pmcc/
[33] Treasury Board Secretariat, http://www.tbs-sct.gc.ca/pses-saff/2011/introduction-eng.asp
[34] National Research Council, http://www.nrc-cnrc.gc.ca/eng/about/corporate_overview/index.html